DISCIPLINARUM SCIENTIA *Disciplinarum Scientia.* **Série: Ciências da Saúde**
Santa Maria, v. 27, n. 1, p. 57-64, 2026
Recebido em: 31.01.2026. Aprovado em: 17.07.2026.
ISSN 2177-3335 | DOI: doi.org/10.37777/dscs.v27n1-5692

BODY ADIPOSITY AND LOW BACK PAIN IN OLDER WOMEN: EVIDENCE FROM DUAL-ENERGY X-RAY ABSORPTIOMETRY

ADIPOSIDADE CORPORAL E DOR LOMBAR EM MULHERES IDOSAS: EVIDÊNCIAS A PARTIR DA ABSORCIOMETRIA DE RAIOS X DE DUPLA ENERGIA

Andressa Bressan Pedroso[1], Diego Chemello[2], Letícia Mazocco[3], Lia Mara Wibelinger[4] e Patrícia Chagas[5]

ABSTRACT

Introduction: Low back pain is a prevalent and debilitating condition in the elderly population, with significant implications for health and quality of life. Overweight and obesity are associated with musculoskeletal changes, among other chronic health problems. Objective: To evaluate the association between body composition and low back pain in elderly women. Methods: This was an observational, descriptive, cross-sectional study. Body composition was assessed using anthropometry and dual-energy X-ray absorptiometry (DXA). The prevalence of low back pain and sample characteristics were evaluated using a structured questionnaire. Descriptive statistics and Student's *t* test were used to compare mean values. Results**:** The study included 288 elderly women, of whom 147 (51%) reported low back pain. Women with low back pain had significantly higher body mass index (BMI), waist circumference (WC), sagittal abdominal diameter (SAD), and percentage of total body fat, as well as higher fat accumulation in the android region and upper limbs. Conclusions**:** An association was observed between excess body weight, adiposity, and the presence of low back pain in elderly women, indicating that these factors are relevant for assessment and management in this population.

Keywords: Low Back Pain; Obesity; Aged; Photon Absorptiometry; Adiposity.

RESUMO

Introdução: A dor lombar é uma condição prevalente e debilitante na população idosa, com implicações significativas para a saúde e qualidade de vida. O excesso de peso e obesidade estão associados a alterações musculoesqueléticas, entre outros problemas crônicos de saúde. Objetivo: avaliar a associação entre a composição corporal e a dor lombar em mulheres idosas. Métodos: estudo observacional, descritivo e transversal. A composição corporal foi medida por antropometria e densitometria por Absorciometria de Raios X de Dupla Energia (DXA). A prevalência de dor lombar e as características da amostra foram avaliadas através de questionário estruturado. Foram utilizadas estatísticas descritivas e o teste t de Student para comparação das médias. Resultados: a pesquisa envolveu 288 mulheres idosas, e revelou que 147

1 M.Sc. in Gerontology. Federal University of Santa Maria, University Hospital of Santa Maria, Santa Maria, Rio Grande do Sul, Brazil. E-mail: nutridessapedroso@gmail.com. ORCID: https://orcid.org/0000-0002-7648-6268

2 Ph.D. in Cardiology. Department of Clinical Medicine, Federal University of Santa Maria, Santa Maria, RS, Brazil. E-mail: chemello.diego@gmail.com. ORCID: https://orcid.org/0000-0003-2051-2321

3 M.Sc. in Gerontology. Federal University of Santa Maria, Graduate Program in Gerontology, Santa Maria, RS, Brazil. E-mail: lety.mazocco@gmail.com. ORCID: https://orcid.org/0000-0003-4981-0760

4 Ph.D. in Biomedical Gerontology and Faculty Member in the Physical Therapy Program. University of Passo Fundo, Department of Physical Therapy, Passo Fundo, RS, Brazil. E-mail: liafisio@upf.br. ORCID: https://orcid.org/0000-0002-7345-3946

5 Ph.D. in Biomedical Gerontology. Department of Public Health, Federal University of Santa Maria, Santa Maria, RS, Brazil. E-mail: patriciachagas@ufsm.br. ORCID: https://orcid.org/0000-0001-9808-2187

(51%) participantes apresentavam dor lombar. Observou-se que mulheres com dor lombar apresentaram significativamente maior Índice de Massa Corporal (IMC), circunferência da cintura (CC), diâmetro abdominal sagital (DAS), e percentual de gordura total, na região androide e nos membros superiores. Conclusões: foi observada associação entre o excesso de peso, a adiposidade e a presença de dor lombar em mulheres idosas, mostrando-se um fator relevante para avaliação e manejo nesta população.

Palavras-chave: *Dor lombar; Obesidade; Idosos; Absorciometria de Fóton; Adiposidade.*

INTRODUCTION

Low back pain is defined as pain or discomfort below the costal margin and above the superior gluteal line, and may extend to the lower limbs; it is considered chronic if it persists for more than three months (Airaksinen *et al*., 2006). It is the leading cause of disability worldwide, and occurs more frequently and intensely in older people, with an estimated prevalence of 21.7% to 75% in this population. In Brazil, 33.6% to 68.36% of older people experience low back pain (Souza *et al*., 2019).

The impacts of low back pain extend not only to health, but also to social and economic aspects. Pain leads to limitations in daily activities and work, and financial costs, requiring greater resources in health (Hoy *et al*., 2010). In older people, it generates a higher level of dependence and can contribute to the emergence of frailty and geriatric syndromes (Lemos *et al*., 2019).

Among the main risk factors identified for low back pain are individual aspects, such as age, previous history of low back pain, poor general health status, and physical and psychological stress factors (such as sleep problems) (Parreira *et al*., 2018). Overweight and obesity are associated with musculoskeletal changes, as well as other chronic problems, such as cardiovascular disease and diabetes. Worldwide, 39% of people are overweight and 13% are obese, and these numbers have tripled since 1975 (World Health Organization, 2024).

In this sense, a sedentary lifestyle, combined with body composition, exerts a significant influence on the development of low back pain, due to biomechanical modifications and systemic inflammatory changes capable of generating or aggravating pain (You *et al*., 2021). While high body mass index and obesity in its diferent phenotypes are associated with an increased risk of low back pain, reduced skeletal muscle mass and decreased lumbar lordosis have been associated with chronic low back pain in older adults (Karimi *et al*., 2022; Park; Park; Chung, 2023; Zhang *et al*., 2024).

The aim of the present study was to evaluate the association between body composition, through body anthropometry and Dual-Energy X-ray Absorptiometry (DXA), and low back pain in elderly women.

METHODS

This was an observational, descriptive, and cross-sectional study with elderly women who were referred for bone densitometry by DXA at a diagnostic imaging clinic in Palmeira das Missões (Rio Grande do Sul). Data were collected from July 2016 to April 2017, and from January to July 2018. With the participants consent, in addition to the densitometry protocols, a whole-body DXA scan was also performed at the time for subsequent evaluation of body composition. Sociodemographic data (age, marital status, education, and occupation) and the presence of low back pain were obtained through a structured questionnaire developed by the authors. Participants were stratified into groups with and without self-reported low back pain, allowing for comparison of outcomes between the groups.

ANTHROPOMETRIC MEASUREMENTS

Measurements such as weight, height, waist circumference (WC), and sagital abdominal diameter (SAD) were taken by trained researchers. Weight was measured using a calibrated mechanical anthropometric scale (110 CH, Welmy; Brazil) with the elderly women barefoot, wearing only a hospital gown. Height was measured using the metal stadiometer of the anthropometric scale, with the participants in an upright position, arms hanging along the body, heels together, and the occipital and gluteal regions touching the vertical plane of the scale's stem. Body mass index (BMI) was calculated according to Quetelet [weight (kg/height(m)^2]. Waist circumference (WC) was measured with the individual in a supine position, at the narrowest point in the trunk region (natural waist), as suggested by the Anthropometric Standardization Reference Manual (Lohman *et al.*, 1988). The SAD measurement was performed using a Cescorf brand caliper with a movable arm, in which the participants stood with their arms crossed over their chest. The caliper was positioned horizontally and one of the flexible arms was placed on the anterior surface of the abdomen, just below the navel. Slowly, the other arm was closed until it touched the skin surface at the level of the 5th lumbar vertebra. The measurement was performed at the end of the participant's expiration (International Society for the Advancement of Kinanthropometry, 2011).

The body composition of the elderly women was assessed using whole-body DXA scanning (GE Lunar DPX-NT). 150951; General Electric Healthcare, Madison, WI, USA). The examinations were performed with the participants after 30 minutes of rest, wearing only a hospital gown, and without any metallic objects.

STATISTICAL ANALYSIS

Regarding the statistical analysis, the normality of the distribution of quantitative data was verified using the Kolmogorov-Smirnov test, and all variables presented a symmetrical distribution, being

described by mean and standard deviation. Categorical variables were represented by absolute and relative values. The Student's t-test was used to identify differences in means between groups of women with and without low back pain, and Pearson's chi-square test was used to assess the association between categorical measures. All analyses were performed using the Statistical Package for the Social Sciences - SPSS software, version 21.0 (IBM; Armonk, USA), and p-values <0.05 were considered significant.

ETHICAL ASPECTS

The research protocol was previously approved by the Research Ethics Committee of the Federal University of Santa Maria under CAEE number 989616.8.0000.5346. All precepts of Resolution No. 466/12 of the National Health Council were followed. Participation of individuals was voluntary and with consent, through the completion of the informed consent form.

RESULTS

In this study, 288 women were evaluated, of which 147 (51%) presented with low back pain (Table 1). The majority of the sample consisted of elderly retired women (93.1%), married (60.1%), and with 4 to 8 years of schooling (37.2%). Regarding the pathologies evaluated, 37.2% of the sample reported having dyslipidemia, 16% reported having Diabetes Mellitus (DM), and 63.2% Systemic Arterial Hypertension (SAH). None of the general characteristics of the sample, as well as the presence of comorbidities evaluated, showed significant differences between the groups (Table 1).

Table 1 - Sociodemographic data and characteristics of the sample.

	Without Low Back Pain (n=147)	**With Low Back Pain (n=141)**	**P value**	**Total**
Age (mean ± SD)	68,32 ± 6,10	66,88 ± 5,34	0,17	67,61 ± 5,38
Occupation				
Retired (%)	136 (50,7)	132 (49,3)	0,231	268 (93,1)
Marital Status			0,489	
Married	86 (49,7)	87 (50,3)		173 (60,1)
Single	7 (41,2)	10 (58,8)		17 (5,9)
Separated/Widowed	54 (55,1)	44 (44,9)		98 (34)
Education Level(%)			0,631	
< 4 years	52 (50)	52 (50)		104 (36,1)
4 a 8 years	64 (50,4)	63 (49,6)		127 (37,2)
> 8 years	31 (54,4)	26 (45,6)		57 (19,8)
Dyslipidemia (%)	99 (54,7)	82 (45,3)	0,107	107 (37,2)
Diabetes *Mellitus*	123 (50,8)	119 (49,2)	0,867	46 (16)
Hypertension	59 (55,7)	47 (44,3)	0,233	182 (63,2)

SD Standard Deviation. Source: Authors.

Table 2 presents the anthropometric parameters of women with and without low back pain. It was observed that women with low back pain had significantly higher BMI (p=0.022), WC (p=0.004), SAD (p=0.022), as well as the percentages of fat in the arm region (p=0.002), trunk (p=0.028), android (p=0.011), gynecoid (p=0.046) and total fat (p=0.015), compared to elderly women without low back pain. Only the percentagem of body fat in the legs was not different between the groups.

Table 2 - Anthropometric parameters of women with and without low back pain.

	Without low back pain (n=147)	**With low back pain (n=141)**	**P value**
BMI (kg/m²)	27,02 ± 4,68	28,18 ± 5,03	0,022
WC (cm)	86,58 ± 11,78	90,46 ± 13,11	0,004
SAD (cm)	25,44 ± 4,08	26,50 ± 4,80	0,022
DXA (% total body fat)			
Arm	34,71 ± 9,14	37,93 ± 9,21	0,002
Leg	38,91 ± 10,08	40,58 ± 9,17	0,072
Trunk	43,62 ± 9,12	48,51 ± 29,36	0,028
Android region	45,70 ± 10,59	48,45 ± 9,60	0,011
Gynoid region	45,28 ± 8,13	46,71 ± 6,94	0,046
Total	39,99 ± 8,63	42,10 ± 7,66	0,015

BMI Body Mass Index; WC Waist Circumference; SAD Sagittal Abdominal Diameter; DXA Dual-Energy X-ray Absorptiometry. Source: Authors.

DISCUSSION

This study demonstrated an association between excess weight, adiposity, and the presence of low back pain in elderly women. In the studied population, almost Half of the sample presented low back pain, which corroborates the prevalence observed in elderly people in Brazil (Souza *et al.*, 2019).

Low back pain was more frequent in people with higher BMI, WC, and SAD. In this sense, a meta-analysis involving fifteen studies with 92,936 adult and elderly participants of both sexes demonstrated that people with obesity had a higher risk of developing low back pain (You *et al.*, 2021). In addition, the same study demonstrated a significant relationship with the parameters of abdominal circumference, waist-to-hip ratio, body fat ratio, and total body fat mass (You *et al.*, 2021).

Among the groups, a relationship was observed between the presence of low back pain and a higher percentage of total fat, and with the accumulation of fat in the android region and arms, in relation to the group without low back pain. In this sense, a longitudinal study conducted in Australia with 5058 men and women demonstrated that higher adiposity assessed by bioimpedance was related to greater intensity of low back pain. Among women, higher levels of muscle mass showed an inverse association with the intensity of low back pain and functional disability, showing a linear reduction proportional to the increase in muscle mass (Hussain *et al.*, 2017).

In the systematic review by Peiris *et al.* (2021), evidence was shown between central adiposity and low back and knee pain. This showed, for the first time, that fat distribution, and not just adiposity or body mass, influences musculoskeletal pain (Peiris *et al.*, 2021). Another meta-analysis demonstrated the relationship between fat mass and generalized pain, low back pain, knee pain, and foot pain (Walsh *et al.*, 2024).

It is understood that low back pain has a multifactorial etiology, and the mechanisms by which excess weight and adiposity could contribute to low back pain are diverse. Two main mechanisms have been described in longitudinal studies: firstly, excess adiposity, mainly in the abdominal region, leads to gravitational overload on the intervertebral discs, contributing to continuous local stress, in addition to greater stress during movement, for example, when lifting objects or descending stairs (Hussain *et al.*, 2017; You *et al.*, 2021; Han *et al.*, 1997). The second mechanism involves the metabolic actions of adipose tissue, which continuously produces pro-inflammatory cytokines such as TNF-alpha, interleukins, and adiponectin, with na increase in these parameters observed in patients with chronic low back pain. Furthermore, it is understood that vascular changes caused by atherosclerosis, a disease aggravated by systemic inflammation, can contribute to reduced blood supply to the muscles of the lumbar region and consequently poorer nutrition of the intervertebral disc, leading to degeneration (Hussain *et al.*, 2017).

In addition, our population presented characteristics that, in themselves, are considered risk factors in the development of low back pain: women may have greater susceptibility regardless of age, due to factors related to pain sensitivity. With aging, especially in the post-menopausal period, women also become more susceptible to musculoskeletal pain due to the increased risk of disc degeneration, osteoporosis, and sarcopenia (Souza *et al.*, 2019; Chin *et al.*, 2022).

It is important to highlight the impact of this problem on the active lives of the population: low back pain was considered the leading cause of years lived with disability between 1990 and 2017 in the Global Burden of Disease Study, especially in working years (Wu *et al.*, 2020). Older adults with musculoskeletal pain more frequently present with frailty, depression, cognitive decline, and geriatric syndromes (Lemos *et al.*, 2019). Thus, in this population, pain threatens independence, autonomy, and safety, preventing them from performing activities of daily living and limiting social life, potentially reducing quality of life and even longevity (Souza *et al.*, 2019).

CONCLUSION

This study evaluated the association between body composition through anthropometry and DXA, and low back pain in older women. It was found that there is an association between excess weight, adiposity, and the presence of low back pain in this population. Therefore, it is understood that healthcare professionals should be attentive to the body composition of elderly women with low

back pain, highlighting the importance of nutritional monitoring associated with a multidisciplinary approach, focusing on optimizing nutritional status, functionality, and quality of life in old age.

REFERENCES

AIRAKSINEN, O. *et al.* Chapter 4: European guidelines for the management of chronic nonspecific low back pain. **European Spine Journal**, Berlin, v. 15, n. S2, p. S192-300, mar. 2006.

CHIN, K. Y. *et al.* A Mini Review on Osteoporosis: From Biology to Pharmacological Management of Bone Loss. **Journal of Clinical Medicine**, v. 11, n. 21, p. 6434, 2022.

HAN, T. *et al.* The prevalence of low back pain and associations with body fatness, fat distribution and height. **International Journal of Obesity**, London, v. 21, n. 7, p. 600-607, jul. 1997.

HOY, D. *et al.* The Epidemiology of low back pain. **Best Practice & Research Clinical Rheumatology**, London, v. 24, n. 6, p. 769-781, dez. 2010.

HUSSAIN, S. M. *et al.* Fat mass and fat distribution are associated with low back pain intensity and disability: results from a cohort study. **Arthritis Research & Therapy**, London, v. 19, n. 1, p. 1-10, 10 fev. 2017.

INTERNATIONAL SOCIETY FOR THE ADVANCEMENT OF KINANTHROPOMETRY. **International Standards for Anthropometric Assessment**. New Zealand: ISAK, 2011.

KARIMI, S. *et al.* Obesity phenotypes related to musculoskeletal disorders: a cross-sectional study from RaNCD cohort. **Archives of Public Health**, v. 80, n. 1, p. 185, 2022.

LEMOS, B. de O. *et al.* The impact of chronic pain on functionality and quality of life of the elderly. **Brazilian Journal of Pain**, São Paulo, v. 2, n. 3, p. 1-10, 2019.

LOHMAN, T. G.; ROCHE, A. F.; REYNALDO, M. **Anthropometric Standardization Reference Manual**. Champaign: Human Kinetics, 1988.

PARK, M. W.; PARK, S. J.; CHUNG, S. G. Relationships between skeletal muscle mass, lumbar lordosis, and chronic low back pain in the elderly. **Neurospine,** v. 20, n. 3, p. 959, 2023

PARREIRA, P. *et al.* Risk factors for low back pain and sciatica: an umbrella review. **The Spine Journal**, New York, v. 18, n. 9, p. 1715-1721, set. 2018.

PEIRIS, W. L. *et al.* Is adiposity associated with back and lower limb pain? A systematic review. **PloS One**, v. 16, n. 9, e0256720, 2021.

SOUZA, I. M. B. de *et al.* Prevalence of low back pain in the elderly population: a systematic review. **Clinics**, São Paulo, v. 74, p. 79, 2019.

WALSH, T. P. *et al.* The association between body fat and musculoskeletal pain: a systematic review and meta-analysis. **BMC Musculoskeletal Disorders**, v. 19, n. 1, 18 jul. 2018.

WORLD HEALTH ORGANIZATION. **Obesity and overweight**. WHO, 2024. Disponível em: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight. Acesso em: 3 set. 2024.

WU, A. *et al.* Global low back pain prevalence and years lived with disability from 1990 to 2017: estimates from the Global Burden of Disease Study 2017. **Annals of Translational Medicine**, China, v. 8, n. 6, p. 299-299, mar. 2020.

YOU, Q. *et al.* Waist circumference, waist-hip ratio, body fat rate, total body fat mass and risk of low back pain: a systematic review and meta-analysis. **European Spine Journal**, Berlin, v. 31, 24 set. 2021.

ZHANG, C. *et al.* The burden, trends, and projections of low back pain attributable to high body mass index globally: an analysis of the global burden of disease study from 1990 to 2021 and projections to 2050. **Frontiers in Medicine**, v. 11, p. 1469298, 2024.