Sarcopenia, chronic pain, and perceived health of older: a cross-sectional study

Sarcopenia, dor crônica e percepção de saúde do idoso: um estudo transversal

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Abstract

Introduction: Aging is a dynamic and progressive process that can be associated with the presence of morbidities, such as chronic diseases, and functional decline, characteristic of sarcopenia, which directly affects the self-perceived health of the older. **Objective:** To test the hypothesis that there is an association between sarcopenia, chronic pain, and perceived health in the older. **Methods:** The study used a quantitative approach and enrolled 43 sarcopenic elderly individuals registered in the University of The Third Age Program (UATI) at Universidade do Estado da Bahia, in Brazil, between November and December 2019. Data included patients' sociodemographic and anthropometric characteristics, self-reported morbidities, multimorbidity, history of chronic pain and perceived health. The data were subjected to descriptive statistical analyses. Crossing of data was performed using Pearson's chi-square test, and the correlation coefficient was assessed using Cramer's Phi and V tests. **Results:** There was an association of sarcopenia with chronic pain ($p = 0.027$) and with age group ($p = 0.016$), however not with perceived health ($p = 0.09$). There was also no association between age range and chronic pain ($p > 0.05$). **Conclusion:** According to the findings of this study, it can be concluded that sarcopenia is associated with the presence of chronic pain and the age of the elderly, not being associated with the perception of health. However, the age of the elderly was not associated with the presence of chronic pain.

Keywords: Chronic pain. Elderly. Sarcopenia.

Resumo

Introdução: *O envelhecimento é um processo dinâmico e progressivo que pode estar associado à presença de morbidades, como doenças crônicas, e ao declínio funcional, característico da sarcopenia, que afeta diretamente a autopercepção de saúde do idoso.* ***Objetivo:*** *Testar a hipótese de que existe associação entre sarcopenia, dor crônica e percepção de saúde em idosos.* ***Métodos:*** *O estudo utilizou uma abordagem quantitativa e envolveu 43 idosos sarcopênicos cadastrados na Universidade Aberta da Terceira Idade (UATI) da Universidade do Estado da Bahia, no Brasil, entre novembro e dezembro de 2019. Dados incluíram características sociodemográficas e antropométricas dos pacientes, morbidades autorreferidas, multimorbidade, história de dor crônica e percepção de saúde. Os dados foram submetidos a análises estatísticas descritivas. O cruzamento dos dados foi feito pelo teste de qui-quadrado de Pearson e o coeficiente de correlação foi avaliado pelos testes Phi e V de Cramer.* ***Resultados:*** *Houve associação da sarcopenia com dor crônica (p = 0,027) e com faixa etária (p = 0,016), porém não houve associação com a percepção de saúde (p = 0,09). Também não houve associação entre faixa etária e dor crônica (p > 0,05).* ***Conclusão:*** *De acordo com os achados deste estudo, pode-se concluir que a sarcopenia está associada à presença de dor crônica e à idade do idoso, não estando associada à percepção de saúde. No entanto, a idade dos idosos não foi associada à presença de dor crônica.*

Palavras-chave: *Dor crônica. Idoso. Sarcopenia.*

Introduction

The aging process is dynamic, progressive, and characterized by several manifestations in the biological, psychological, and social fields that occur throughout life in a different way in each subject. Therefore, old age should not be confused with disease; rather, it should be understood in its bio-psycho-socio-economic-spiritual and cultural context as well as its consequences in the multiplicity of associated problems that may or may not be presented. Thus, it requires consideration of the acceptance process and encouragement of autonomy, participation, and responsibility in treatment. Hence, the health and well-being of the older are closely related to their autonomy and degree of independence.[1,2]

In Brazil, approximately 30.1% of people aged 60 years or older have functional limitations characterized by difficulty performing at least one out of 10 basic or instrumental activities of daily living (ADLs).[3] ADLs are daily tasks performed in the environment in which an individual lives, whether inside or outside the home, such as caring for their own bodies; making and receiving visits; participating in cultural, recreational, and leisure activities; driving; traveling; doing volunteer or paid work; and participating in activities of community and citizen life (meetings, organizations, associations, and social groups).[4]

The inability to perform these activities, from the most complex to the most basic, indicates a process of functional decline. That is, an individual's health conditions can compromise their functional capacities, and important declines can result from events such as falls, infections, decompensation of chronic illnesses, and the emergence of acute illnesses.[4]

Sarcopenia is a generalized muscle disorder with a progressive nature, which is associated with an increased likelihood of adverse outcomes. The European Working Group on Sarcopenia in Older People (EWGSOP) added muscle function to previous definitions of sarcopenia based solely on reduced muscle mass. Current guidelines recognize that muscle strength is better than mass in predicting the onset of adverse outcomes. However, the identification of muscle quantity and quality, as primary parameters to define sarcopenia, still has technological limitations. Therefore, it can be considered that low physical performance predicts adverse outcomes.[5]

Muscle strength is currently considered the most reliable assessment of muscle function, and when low muscle strength is detected, the presence of sarcopenia is likely. According to the scientific literature, there are three criteria to be analyzed in relation to the diagnosis and classification of sarcopenia: 1 - low muscle strength; 2 - low muscle quantity or quality; 3 - low physical performance. Thus, criterion 1 indicates probable sarcopenia, criterion 2 is used to confirm the diagnosis and, if criteria 1, 2, and 3 are observed, sarcopenia is considered severe.[5]

This clinical syndrome can generate adverse effects such as falls, functional dependence, hospitalization, institutionalization, and death.[2] Sarcopenia can have a primary origin, such as that associated with only the aging process, or secondary, when it is related to other triggering factors, such as physical inactivity, which includes periods of prolonged rest, a sedentary lifestyle, deconditioning, or conditions of zero gravity.[6]

There appears to be an association between sarcopenia and chronic pain in the older.[6,7] A study conducted in 2010 among 872 Brazilians over the age of 60 years reported that the majority of the older population (52.7%) suffered from high-intensity chronic pain (54.6%) in regions that may compromise activities of commuting and other functional ADLs, imposing disability and loss of quality of life.[8] Certain chronic diseases, especially arthritis and osteoporosis, are generally associated with the prevalence of pain in old age as well as sarcopenia, exerting an important influence on functional disability and fragility.[5,9]

An individual's self-perceived health accurately reflects their general health status, especially in the older, as it has been shown that there is a relationship between the perceived health and functional limitations of this population.[10] A study of adult people in the capitals of northeastern Brazil and Portugal showed that the prevalence of a bad self-rated health was significantly higher among people with lower education levels, with chronic illness (hypertension, diabetes, or obesity), and of female sex.[11] Another study identified that the perception of health is better among men - this perception also corresponds to a lower prevalence of diseases and health problems among men -, and found a directly proportional relationship between age and perception of health; that is, the older the individual, the worse the self-perceived health.[12]

Knowing how the older perceive their health and how they manage functional decline is essential to the design of health promotion and care for the older. It is important to emphasize the importance of conducting studies that evaluate factors associated with health conditions in the older population, such as sarcopenia and pain, to contribute to interventional strategies and action plans that promote well-being and prevent the aggravation of certain conditions that directly interfere with the functional capacity and quality of life of the older. Therefore, the present study aimed to test the hypothesis that there is an association between sarcopenia, chronic pain, and perceived health in the older.

Methods

This cross-sectional study used a quantitative correlational approach to examine the association between sarcopenia and chronic pain and perceived health in the older. A non-probabilistic type of convenience sampling was used, and the sample consisted of older people registered in the University of Third Age (UTA) program of Universidade do Estado da Bahia (UNEB), in Brazil. This research was based on data from a larger project that aimed to verify the effect of a multidisciplinary approach program on the quality of life of the older at UTA, which was developed by researchers linked to a group of studies and research on quality of life and healthy aging (QUALES) from UNEB. The study design and conduct followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE)[13] recommendations. Data collection was performed from November to December 2019, after approval by the Ethics Committee in research involving human beings from UNEB process no. 25875819.8.0000.0057. All study participants agreed to participate and signed an informed consent form.

The following inclusion criteria were adopted: being of either sex and 60 years of age or older. Participants who had cognitive decline identified through the Mini-Mental State Exam (MMSE) were excluded from the study.[14] Data were collected regarding the patients' sociodemographic and anthropometric characteristics, self-reported morbidities, presence of multimorbidity (≥ 2 chronic diseases), history of chronic pain, and perceived health. The MMSE was also administered.[14]

Regarding anthropometric variables, weight was verified using a Welmy® anthropometric scale with a capacity of 150 kg placed on a flat surface. The participants were instructed to wear light clothing and asked to climb barefoot with empty pockets onto the center of the base of the scale with the body upright and weight evenly distributed between the feet, arms at the sides, and eyes looking forward. Height (in meters) was measured with a vertical stadiometer attached to the scale, with the participant facing away from the apparatus, legs and feet parallel, arms lateralized, and palms facing the body. Body mass index (BMI) was determined by the ratio of body mass in kilograms divided by height in meters squared. Waist circumference was measured at the smallest curvature located between the ribs and the iliac crest using a Cescorf® flexible inelastic anthropometric tape at the end of expiration without compressing the tissues, while hip circumference was measured at the most prominent place in the gluteal region.

The MMSE includes eleven items divided into two sections. The first requires verbal responses to questions

about orientation, memory, and attention; the second concerns reading, writing, and skills such as naming, following verbal commands, writing a sentence, and copying a drawing (polygons). All questions were asked in the order listed and scored immediately by adding the points assigned to each successfully completed task for a maximum score of 30 points. The cutoff points adopted were as follows: 20 points for illiterate, 25 points for 1-4 years of education, 26.5 points for 5-8 years of education, 28 points for 9-11 years of education, and 29 points for more than 11 years of education.[14]

Physical performance was evaluated by gait speed over an 8-m course in which the speed was computed only in the central 4-m interval to allow for time to accelerate and decelerate. The participants were encouraged to walk using their usual shoes and walking aids, if needed, at their usual speed. Two measures were computed to estimate the average value. A 1-min interval was given between repetitions. Reduced physical performance was identified at a gait speed of < 0.8 m/s.

Chronic pain is characterized as pain that has persisted for more than three months, manifests continuously or recurrently, and can cause prolonged disability and dependence in ADLs. The participants were dichotomized into a group with no history of chronic pain and a group with a history of chronic pain.

Sarcopenia was diagnosed as reduced skeletal muscle mass associated with muscle weakness and/or poor physical performance.[5,15] Skeletal muscle mass was obtained using the anthropometric equation of Lee et al.,[16] which is highly correlated with magnetic resonance imaging and dual-energy radiological densitometry findings. The equation used for older people with a BMI < 30 kg/m^2 was as follows: skeletal muscle mass based on weight and height: height (meters) × (0.244 × body mass) + (7.8 × height) + (6.6 × sex) – (0.098 × age) + (ethnicity – 3.3), in which the value 0 is assumed for women and 1 for men; and the value 0 is assumed for Caucasians, 1.4 for African-Americans, and -1.2 for Asians. However, for older people with a BMI ≥ 30 kg/m^2, the following equation was used: height × (CAC2 × 0.007444 + 0.00088 × CTC2 + 0.00441 × CCC2) + 2.4 × sex – 0.048 × age + ethnicity + 7.8, in which: CAC = corrected arm circumference; CTC = corrected thigh circumference; and CCC = corrected calf circumference. The corrected value of the circumference (Cm = climb – π × skinfold measurement) was calculated to remove the fat component.[16]

Appropriately trained evaluators measured the skinfolds in the arm, thigh, and medial part of the calf and the circumference of the limbs according to the anthropometric standardization.[17] A Lange® skinfold caliper (Beta Technology, California, USA) was used to measure skinfold thickness, and the mean of three measurements was included in the analysis. Subsequently, the skeletal muscle mass index (SMMI) was calculated by dividing skeletal muscle mass in kilograms by height in meters squared. The cutoff score adopted to define sarcopenia (identified by SMMI) was ≤ 6.37 kg/m^2 for women and ≤ 8.90 kg/m^2 for men.[18]

Handgrip strength was measured to assess muscle strength and identify weakness. While sitting on a chair with the elbows at 90°, each participant was asked to perform a maximum force grip of the Jamar® manual dynamometer (Sammons Preston, Illinois) measured in kgf with scores adjusted by BMI and sex. The grip was tested three times with a 1-min interval between measurements, and the largest value was analyzed.[19] Muscle weakness or dynapenia was identified at Handgrip strength values of < 20 kgf for women and < 30 kgf for men.[20]

The data were subjected to descriptive analysis and are expressed as percentage and absolute frequencies for categorical variables and measures of central tendency and dispersion for numerical variables. The crossing of the data to test the association between variables was performed using Pearson's chi-square test, and the degree of association was assessed using the Phi test and Cramer's V test. For the decision criteria, a significance level of 5% ($p < 0.05$) was adopted, and the statistical procedures were analyzed and processed using the Statistical Package of the Social Sciences® program for Windows® version 21 (SPSS Inc., Chicago, IL).

Results

Descriptive statistics shown that of the 61 potential participants who were invited within the UATI program, 18 did not participate in the entire evaluation process; thus, our study ultimately included 43 subjects (Figure 1). As shown in Table 1, the sample predominantly consisted of women (97.7%) and had an average age of 68.5 ± 6.4 years, low education level (53.5% with elementary education), and low per capita income (79%, ≤ 2× minimum wage).

Most of the subjects lived with family members (74.4%). Self-reported health showed the presence of chronic diseases in 22 participants (51.3%), with the most common diseases being arthrosis/arthritis (53.5%), anxiety (44.2%), arterial hypertension (34.9%), and diabetes (37.2%). The prevalence of multimorbidity (≥ 2 morbidities) was 41.8%.

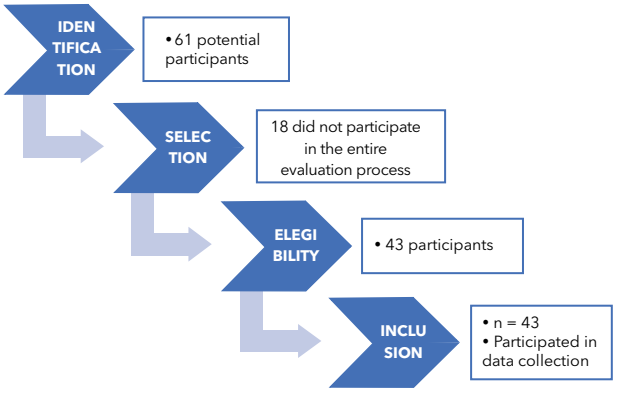

Figure 1 - Strengthening the reporting of observational studies.

An association between sarcopenia and chronic pain [$\chi^{2(1)} = 4.916$; $p = 0.027$] was found (Table 2). The result of the Phi test showed that there is a degree of association in which 33.8% of chronic pain can be explained by sarcopenia.

Table 3 shows an association of sarcopenia and chronic pain with age range groups [$\chi^{2(2)} = 8.278$; $p = 0.016$]. Cramer's V shows a degree of association of 43.9% between sarcopenia and age group, showing that the older the age, the higher the incidence of sarcopenia. This same test did not show an association between chronic pain and the age group of the elderly [$\chi^{2(2)} = 1.444$; $p = 0.486$].

The chi-square test of independence showed no association between sarcopenia and perceived health ($\chi^{2(3)} = 6.300$; $p = 0.09$), but an association between chronic pain and perceived health ($\chi^{2(3)} = 8.652$; $p = 0.03$) (Table 4). Cramer's V test indicated that 44.9% of the variation in perceived health can be explained by chronic pain, that is, the presence of chronic pain worsens one's perception of health, demonstrating the negative impact of chronic pain in perceived health.

Table 1 - Sociodemographic and clinical characteristics of the elderly at UATI

Variables	Frequency of participants
Gender (females) - n (%)	42 (97.7)
Age - mean ± SD	68.5 ± 6.4
Education - n (%)	
Elementary	23 (53.5)
High School	17 (39.5)
Higher	3 (7.0)
Marital status - n (%)	
Single	6 (14.0)
Married	20 (46.5)
Widow/Widower	16 (37.2)
Divorced	1 (2.3)
Per capita monthly income - n (%)	
< 1 MW	17 (39.5)
1 to 2 MW	17 (39.5)
> 2 to 3 MW	6 (14.0)
> 3 MW	3 (7.0)
Home arrangement - n (%)	
Lives with family	32 (74.4)
Lives alone	11 (25.6)
Self-reported morbidities - n (%)	
Anxiety	19 (44.2)
Arthrosis/arthritis	23 (53.5)
Arterial hypertension	15 (34.9)
Diabetes	16 (37.2)
Body mass index - mean ± SD	28.1 ± 5.7

Note: UATI = University of The Third Age Program at Universidade do Estado da Bahia (UNEB-VII), Senhor do Bonfim, BA, Brazil, 2019. SD = standard deviation; MW = minimum wage in effect at the time of the survey (R$ 998.00).

Table 2 - Association between sarcopenia and chronic pain in 43 elderly people at UATI

	With chronic pain n (%)	**No chronic pain** n (%)	**p-value**
With sarcopenia	5 (71.4)	2 (28.6)	0.027
Without sarcopenia	10 (27.8)	26 (72.2)	

Note: UATI = University of The Third Age Program at Universidade do Estado da Bahia (UNEB-VII), Senhor do Bonfim, BA, Brazil, 2019.

Table 3 - Association of sarcopenia and chronic pain with age among the 43 elderly at UATI

	Age groups n (%)			
	60 to 69 years	**70 to 79 years**	**≥ 80 years**	**p-value**
With sarcopenia	1 (14.3)	4 (57.1)	2 (28.6)	0.016
Without sarcopenia	21 (58.3)	14 (38.9)	1 (2.8)	
With chronic pain	7 (46.7)	6 (40.0)	2 (13.3)	0.486
Without chronic pain	15 (53.6)	12 (42.9)	1 (3.6)	

Note: UATI = University of The Third Age Program at Universidade do Estado da Bahia (UNEB-VII), Senhor do Bonfim, BA, Brazil, 2019.

Table 4 - Association of sarcopenia and chronic pain with the perceived health of 43 elderly people at UATI

	Perceived health n (%)				
	Bad	**Regular**	**Good**	**Very good**	**p-value**
With sarcopenia	3 (42.9)	2 (28.6)	2 (28.6)	0 (0.0)	0.09
Without sarcopenia	3 (8.3)	11 (30.6)	19 (52.8)	3 (8.3)	
With chronic pain	4 (26.7)	7 (46.7)	4 (26.7)	0 (0.0)	0.03
Without chronic pain	2 (7.1)	6 (21.4)	17 (60.7)	3 (10.7)	

Note: UATI = University of The Third Age Program at Universidade do Estado da Bahia (UNEB-VII), Senhor do Bonfim, BA, Brazil, 2019.

Discussion

The results of the present study are consistent with the research hypothesis indicating that sarcopenia is significantly associated with the presence of chronic pain and the age group of the elderly (60 to 69 years, 70 to 79 years, and ≥ 80 years). However, an association of sarcopenia with the perception of health and age with the presence of chronic pain was not observed.

As a result of the sex-based inequality in life expectancy, a higher proportion of older individuals are women.[21] As with other studies,[22-24] the present study verified the predominance of older women (97.7%). Older women have the opportunity to consolidate their friendships and family relationships, reevaluate the way they use their time, and develop new roles in society, whether that involves changing jobs, starting new professions, entering into new relationships, and leveraging educational opportunities.[21] The mean age of the subjects in the present study was 68.5 ± 6.4 years, reflecting a significant increase in the life expectancy of the Brazilian population for men and women over the years in agreement with national[25] and international[26] findings.

Regarding educational level, 53.5% of our older subjects had only a basic education, converging with studies that reported similar results.[27,28] However, different results were reported by a study on older women from another UATI in Brazil in which 46.75% of the participants had a high school education and 28.75% had a higher education.[29] This finding differs from the reality found in different regions of Brazil, where low education is common and compromises access to health education, a resource that enables the implementation of healthy behaviors and social mobilization to improve one's living conditions and influences treatment adherence for chronic conditions; in short, a lack of education may create patient difficulty understanding the required interventions.[30]

In addition, a low economic situation was identified, with 79% having a family income of less than 2 minimum wages, corroborating an epidemiological profile study carried out in Brazil.[27] A survey concluded that the educational level of the elderly reveals differences in terms of income and self-reported health condition, showing that the more years of study, the better the wage income and the less chance of getting sick, considering the difference in the perception of health.[30]

In our sample, there was a prevalence of married status (46.5%), which differed from that of another psychometric study in which unmarried older people had greater control/autonomy over their lives that contributed to a better perceived quality of life.[31] However, 74.4% of our study participants lived with family members, in line with scientific evidence that the family environment is the main source of support for the older. Thus, it is necessary to encourage the strengthening of family relationships to minimize the difficulties and anguish experienced by the older and their families.[32]

More than half of our older subjects (51.3%) reported having chronic diseases, the most common being arthritis/arthrosis (53.5%), a clinical condition that can increase an individual's risk of falls as identified in a previous study.[33] The prevalence of multimorbidity (≥ 2 morbidities) was 41.8%, corroborating recent evidence that the presence of two or more comorbidities is related to frailty in the older.[34]

Our participants had a higher than average BMI (≥ 22 and ≤ 27 kg/m²).[35] An anthropometric assessment using several indicators proves very useful since each variable provides complementary information.[36,37]

A cross-sectional study verified the relationship between sarcopenia and chronic pain in institutionalized older women[6] since it is similar to the results of the present study. Older people with a painful condition can exclude themselves socially and are prone to physical inactivity, decreased self-esteem, and inadequate self-care. Impaired functional capacity can cause physical and mental dependence as well as the inability to perform ADLs, and sarcopenia can be triggered by starvation in older individuals who suffer from chronic pain.[6]

Dividing of the participants into three age groups (60-69, 70-79, and ≥ 80 years) revealed an association between sarcopenia and age and demonstrated that 43.9% of sarcopenia cases were related to age; that is, the greater the age group, the greater the incidence of sarcopenia as reported elsewhere.[38,39] These results suggest that chronic pain is not associated with age, a finding that diverges from those of previous studies.[40,41]

In the present study, chronic pain was directly associated with worsening health perception, corroborating the findings of a previous investigation.[40] The association between the occurrence of chronic pain and the perception of negative health among the older, coupled with the association between lower pain intensity score and a better perception of health, indicates the importance of including pain measurements in the overall assessment of the older. The aim is to achieve adequate maintenance, replacement, or complementation of analgesic therapy and subsequent greater reductions in morbidity and mortality in this population.[8] A Canadian study[42] (n = 30,685) shows that pain, among other determinants of health, is associated with self-rated health, which is defined as a valid and reliable measure of general health as well as an important predictor of mortality in those aged 70 and over.[42-44] Pain can therefore also be classified as a determinant of morbidity and a predictor of mortality in the elderly, which adds to the interest of optimizing pain management in the latter.

This study has some limitations. First, its use of a cross-sectional design causes reverse causality bias since it is impossible to obtain information about the natural history of diseases and/or events. Second, the sample was composed almost exclusively of women (97.7%). Finally, the self-reported assessment of morbidities may not reliably reflect the participants' diagnoses.

Conclusion

According to the findings of this study, it can be concluded that sarcopenia is associated with the presence of chronic pain and the age of the elderly, not being associated with the perception of health. However, the age of the elderly was not associated with the presence of chronic pain. These findings corroborate existing general conclusions, reinforcing the importance of encouraging studies, assessments, and therapeutic interventions in the functional and biopsychosocial sphere for older patients and highlighting the need to develop interdisciplinary actions to prevent and treat sarcopenia and chronic pain.

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Authors´ contributions

TRO and GSB provided the concept of the study, created the hypothesis, and wrote the original proposal. TRO, GSB and LVFO obtained ethics approval, will be participated in the data collection and performed clinical evaluations. TRO, GSB, LVFO, SN and RAS prepared the drafted manuscript. LVFO, ADM, LPP, RAS and SN were involved in the critical revision of the manuscript. TRO, GSB and LVFO wrote this protocol paper, with input from all co-authors. All authors read and approved the final manuscript.

References

1. Lima DL, Lima MAVD, Ribeiro CG. Envelhecimento e qualidade de vida de idosos institucionalizados. Rev Bras Cienc Envelhec Hum. 2010;7(3):346-56. Full text link

2. Brasil. Envelhecimento e saúde da pessoa idosa. Brasília: Ministério da Saúde; 2006. 192 p. Full text link

3. Lima-Costa MF, Peixoto SV, Malta DC, Szwarcwald CL, Mambrini JVM. Informal and paid care for Brazilian older adults (National Health Survey, 2013). Rev Saude Publica. 2017;51(Supp1):6s. DOI

4. Brasil. Orientações técnicas para a implementação de Linha de Cuidado para Atenção Integral à Saúde da Pessoa Idosa no Sistema Único de Saúde (SUS). Brasília: Ministério da Saúde; 2018.

5. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Sarcopenia: revised European consensus on definition and diagnosis. Age Ageing. 2019;48(1):16-31. DOI

6. Zanin C, Candido JB, Jorge MSG, Wibelinger LM, Doring M, Portella MR. Sarcopenia and chronic pain in institutionalized elderly women. Br J Pain. 2018; 1(4):288-92. DOI

7. Clemente PA, Baroni MP, Camilo AO, Daniel CR, Oliveira FC, Góes LT, et al. Análise da sarcopenia, fragilidade e desempenho funcional de indivíduos com dor crônica. In: Ferrari FCCRC (Org.). Fisioterapia e Terapia Ocupacional: Promoção & Prevenção e Reabilitação 2. Ponta Grossa: Atena; 2021. p. 97-108. DOI

8. Pereira LV, Vasconcelos PP, Souza LAF, Pereira GA, Nakatani AYK, Bachion MM. Prevalência, intensidade de dor crônica e autopercepção de saúde entre idosos: estudo de base populacional. Rev Latino-Am Enfermagem. 2014;22(4):662-9. Full text link

9. Bettiol CHO, Dellaroza MSG, Lebrão ML, Duarte YA, Santo HG. Fatores preditores de dor em idosos do Município de São Paulo, Brasil: Estudo SABE 2006 e 2010. Cad Saude Publica. 2017;33(9):e00098416. DOI

10. Ximenes MA, Del'Vescovo RM, Manchini RF, De Conti MHS, Carvalho e Souza L. Qualidade de vida dos idosos participantes do Projeto "Unidos da Melhor Idade" do Município de Fernão, SP, Brasil. Rev Kairós Geront. 2017;20(1):427-52. DOI

11. Carvalho AT, Malta DC, Barros MBA, Oliveira PNFP, Mendonça DMMV, Barros H. Desigualdades na autoavaliação de saúde: uma análise para populações do Brasil e de Portugal. Cad Saude Publica. 2015;31(11):2449-61. DOI

12. Pérez-Fuentes MC, Molero MM, Mercader I, Soler Flores FJ, Barragán A, Calzadilla Y, et al. Salud percibida y salud real: prevalencia en las personas mayores de 60 años. Enferm Univ. 2015;12(2):56-62. DOI

13. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. Int J Surg. 2014;12(12):1495-9. DOI

14. Brucki SMD, Nitrini R, Caramelli P, Bertolucci PHF, Okamoto IH. Sugestões para o uso do mini-exame do estado mental no Brasil. Arq Neuropsiquiatr. 2003; 61(3-B):777-81. DOI

15. Alexandre TS, Duarte YAO, Santos JLF, Wong R, Lebrão ML. Sarcopenia according to the European Working Group on Sarcopenia in Older People (EWGSOP) versus dynapenia as a risk factor for disability in the elderly. J Nutr Health Aging. 2014; 18(5):547-53. DOI

16. Lee RC, Wang Z, Heo M, Ross R, Janssen I, Heymsfield SB. Total-body skeletal muscle mass: development and cross-validation of anthropometric prediction models. Am J Clin Nutr. 2000;72(3):796–803. DOI

17. Lohman TG, Roche AF, Martorell R. Anthropometric standardization reference manual. Champaign, IL: Human Kinetics Books; 1988. 177 p.

18. Alexandre TS, Duarte YAO, Santos JLF, Wong R, Lebrão ML. Prevalence and associated factors of sarcopenia among elderly in Brazil: findings from the SABE study. J Nutr Health Aging. 2014;18(3):284-90. DOI

19. Reis MM, Arantes PMM. Medida da força de preensão manual: validade e confiabilidade do dinamômetro saehan. Fisioter Pesqui. 2011;18(2):176-81. DOI

20. Lauretani F, Russo CR, Bandinelli S, Bartali B, Cavazzini C, Di Iorio A, et al. Age-associated changes in skeletal muscles and their effect on mobility: an operational diagnosis of sarcopenia. J Appl Physiol (1985). 2003;95(5):1851-60. DOI

21. Salgado CDS. Mulher idosa: a feminização da velhice. Estud Interdiscip Envelhec. 2002;4:7-19. DOI

22. Silva RJS, Smith-Menezes A, Tribess S, Rómo-Perez V, Virtuoso Jr JS. Prevalência e fatores associados à percepção negativa da saúde em pessoas idosas no Brasil. Rev Bras Epidemiol. 2012;15(1):49-62. DOI

23. Sudré MRS, Reiners AAO, Nakagawa JTT, Azevedo RCS, Floriano LA, Morita LHM. Prevalence of dependency and associated risk factors in the elderly. Acta Paul Enferm. 2012;25(6):947-53. DOI

24. Borges JES, Camelier AA, Oliveira LVF, Brandão GS. Quality of life of elderly hypertensive and diabetics of the community: an observational study. J Physiother Res. 2019;9(1):74-84. DOI

25. Camargos MCS, Gonzaga MR, Costa JV, Bomfim WC. Disability-free life expectancy estimates for Brazil and Major Regions, 1998 and 2013. Cienc Saude Colet. 2019;24(3):737-47. DOI

26. Officer A, Thiyagarajan JA, Schneiders ML, Nash P, Fuente-Núñez V. Ageism, healthy life expectancy and population ageing: how are they related? Int J Environ Res Public Health. 2020;17(9):3159. DOI

27. Castro e Borges PL, Bretas RP, Azevedo SF, Barbosa JMM. Perfil dos idosos frequentadores de grupos de convivência em Belo Horizonte, Minas Gerais, Brasil. Cad Saude Publica. 2008;24(12):2798-808. DOI

28. Brandão GS, Camelier FWR, Sampaio AAC, Brandão GS, Silva AS, Gomes GSBF, et al. Association of sleep quality with excessive daytime somnolence and quality of life of elderlies of community. Multidiscip Respir Med. 2018;13:8. DOI

29. Barreto KML, Carvalho EMF, Falcão IV, Lessa FJD, Leite VMM. Perfil sócio-epidemiológico demográfico das mulheres idosas da Universidade Aberta à Terceira Idade no estado de Pernambuco. Rev Bras Saude Mater Infant. 2003;3(3):339-54. DOI

30. Oliveira JS, Freitas SKS, Vilar NBS, Saintrain SV, Bizerril DO, Saintrain MVL. Influência da renda e do nível educacional sobre a condição de saúde percebida e autorreferida de pessoas idosas. J Health Biol Sci. 2019;7(4):395-8. DOI

31. Neri AL, Borim FSA, Batistoni SST, Cachioni M, Rabelo DF, Fontes AP, et al. Nova validação semântico-cultural e estudo psicométrico da CASP-19 em adultos e idosos brasileiros. Cad Saude Publica. 2018;34(10):e00181417. DOI

32. Feliciano AB, Moraes AS, Freitas ICM. O perfil do idoso de baixa renda no Município de São Carlos, São Paulo, Brasil: um estudo epidemiológico. Cad Saude Publica. 2004;20(6):1575-85. DOI

33. Dellaroza MSG, Pimenta CAM, Lebrão ML, Duarte YAO, Braga PE. Associação entre dor crônica e autorrelato de quedas: estudo populacional – SABE. Cad Saude Publica. 2014;30(3):522-32. DOI

34. Mello AC, Engstrom EM, Alves LC. Fatores relacionados à saúde e sociodemográficas associados à fragilidade no idoso: revisão sistemática da literatura. Cad Saude Publica. 2014;30(6):1143-68. DOI

35. Brasil. Caderneta de saúde da pessoa idosa. Brasília: Ministério da Saúde; 2018. Full text link

36. Bauce G. Evaluación antropométrica de un grupo de pacientes adultos mayores. Rev Digital Postgrado. 2020;9(2). DOI

37. Mayhew AJ, Phillips SM, Sohel N, Thabane L, McNicholas PD, Souza RJ, et al. Methodological issues and the impact of age stratification on the proportion of participants with low appendicular lean mass when adjusting for height and fat mass using linear regression: results from the Canadian longitudinal study on aging. J Frailty Aging. 2021;10(2):150-5. DOI

38. Liu X, Hao Q, Yue J, Hou L, Xia X, Zhao W, et al. Sarcopenia, obesity and sarcopenia obesity in comparison: prevalence, metabolic profile, and key differences: results from WCHAT study. J Nutr Health Aging. 2020;24(4):429-37. DOI

39.Pícoli TS, Figueiredo LL, Patrizzi LJ. Sarcopenia e envelhecimento. Fisioter Mov. 2011;24(3):455-62. DOI

40. Romero DE, Santana D, Borges P, Marques A, Castanheira D, Rodrigues JM, et al. Prevalence, associated factors, and limitations related to chronic back problems in adults and elderly in Brazil. Cad Saude Publica. 2018;34(2):e00012817. DOI

41. Dahhlhamer J, Lucas J, Zelaya C, Nahin R, Mackey S, DeBaar L, et al. Prevalence of chronic pain and high-impact chronic pain among adults - United States, 2016. MMWR Morb Mortal Wkly Rep. 2018;67(36):1001-6. DOI

42. Chireh B, D'Arcy C. Pain and self-rated health among middle-aged and older Canadians: an analysis of the Canadian community health survey-healthy aging. BMC Public Health. 2018;18(1):1006. DOI

43. Reyes-Gibby CC, Aday L, Cleeland C. Impact of pain on self-rated health in the community-dwelling older adults. Pain. 2002;95(1-2):75-82. DOI

44. Siedlecki SL. Predictors of self-rated health in patients with chronic nonmalignant pain. Pain Manag Nurs. 2006;7(3):109-16. DOI