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Factors associated with risk of sarcopenia in older adults

Fatores associados com o risco de sarcopenia em idosos

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ABSTRACT

This study aimed to assess the factors associated with the risk of sarcopenia in older adults who attend social groups. This is a cross-sectional conducted with 207 older adults. A sociodemographic questionnaire, the International Physical Activity Questionnaire (IPAQ) and the SARC-f questionnaire were used as instruments. Data analysis was carried out by using the chi-squared test and the Binary Logistic Regression ($p < 0.05$). The results showed a significant association of the risk of sarcopenia with the education level ($p = 0,016$). There was a significant difference among the groups in self-perceived health ($p = 0.001$), health perception compared to older adults of the same age ($p = 0.001$), amount of medications used ($p = 0.001$), history of falls ($p = 0.001$) and near-falls ($p = 0.001$). No significant difference was found in the risk of sarcopenia with level of physical activity. When comparing the ratios of diseases reported according to the risk of sarcopenia, there was a significant difference in heart disease ($p = 0.001$), systemic arterial hypertension ($p = 0.001$), stroke ($p = 0.001$), diabetes ($p = 0.049$), osteoarthritis ($p = 0.001$), lung disease ($p = 0.034$), depression ($p = 0.001$) and osteoporosis ($p = 0.001$). The logistic regression revealed that the older adults who had no history of falls and reported no heart disease, lung disease, depression or osteoporosis were more likely to have no risk of sarcopenia. Therefore, it was concluded that the education level and health conditions reported by the older adults can be considered as factors associated with the risk of sarcopenia. The level of physical activity is not a factor associated with the indication of sarcopenia.

Keywords: Sarcopenia; Aging; Social groups; Educational status; Health.

RESUMO

Este estudo teve como objetivo avaliar os fatores associados ao risco de sarcopenia em idosos que frequentam grupos sociais. Trata-se de um estudo transversal realizado com 207 idosos. Utilizaram-se como instrumento os questionários sociodemográficos, o International Physical Activity Questionnaire (IPAQ) e o SARC-f. A análise dos dados foi realizada pelo teste do qui-quadrado e pela regressão logística binária ($p < 0,05$). Os resultados mostraram associação significante do risco de sarcopenia com o nível de escolaridade ($p = 0,016$). Houve diferença significante entre os grupos com e sem risco de sarcopenia em relação à autopercepção de saúde ($p = 0,001$), percepção de saúde em comparação com idosos da mesma idade ($p = 0,001$), quantidade de medicamentos utilizados ($p = 0,001$), histórico de quedas ($p = 0,001$) e quase quedas ($p = 0,001$). Não foi encontrada diferença significativa do risco de sarcopenia com nível de atividade física. Ao comparar as proporções de doenças relatadas de acordo com o risco de sarcopenia, houve diferença significante entre cardiopatia ($p = 0,001$), hipertensão arterial sistêmica ($p = 0,001$), acidente vascular cerebral ($p = 0,001$), diabetes ($p = 0,049$), osteoartrite ($p = 0,001$), doença pulmonar ($p = 0,034$), depressão ($p = 0,001$) e osteoporose ($p = 0,001$). A regressão logística revelou que os idosos que não tinham histórico de quedas e não relataram cardiopatia, doença pulmonar, depressão ou osteoporose apresentaram maior probabilidade de não ter risco de sarcopenia. Concluiu-se que o nível de escolaridade e as condições de saúde relatadas pelos idosos podem ser considerados fatores associados ao risco de sarcopenia. O nível de atividade física não é um fator associado ao risco de sarcopenia.

Palavras-chave: *Sarcopenia; Envelhecimento; Grupos sociais; Escolaridade; Saúde.*

Introduction

The natural aging process is related to reductions from 1% up to 3% in different biological systems each year, especially after the fifth decade of life[1,2]. These reductions refer to changes in body composition components, muscle mass reduction, associated with low levels of muscular strength so-called sarcopenia[3]. Sarcopenia has been extensively investigated, since it is related to the loss of autonomy[4], increase in the number of falls and fractures[5], decreased bone mineral density[6], reduced quality of life, fragility, functional disability and premature death[7].

Information available in the literature indicates that its prevalence might vary between 7% and 50% in the older adults[8], that is, 20% among women and 12% among men in Brazil[9]. Its emergence and development can be triggered by lack of physical activity, sedentary behavior, decreased protein synthesis, hormonal changes, as well as loss of motor neurons[3], which is characterized, in etiological terms, as a multifactorial disease. It is worth mentioning that sarcopenia is a public health problem, considering that sarcopenic older adults generally need special care, which leads to increased costs for the public health system[10, 11].

Over the years, several studies have been carried out in order to analyze the factors that might be associated with sarcopenia, including advanced age, low body mass index, presence of heart disease[12], stress, smoking habit, dementia, marital status, blood pressure[13], chronic renal disease[14] and low level of physical activity[15]. Thus, understanding the possible factors associated with sarcopenia is extremely important so as to combat this disease that affects the older adults and provide them with an independent and dignified life. Although the aforementioned studies have analyzed the possible associated factors with sarcopenia, these investigations were conducted in countries other than Brazil, such as Japan, Sweden, Korea, and Peru. Thus, it is crucial to conduct investigations in Brazil, especially in different states of the country, in order to better elucidate this subject. Taking into account that the practice of physical activity generates numerous benefits for the elderly population and that there is a need for updating by health professionals to this population that has increased exponentially.

Therefore, this study aimed at assessing the physical activity and factors associated with the risk of sarcopenia in older adults who attend social groups. The hypothesis would be that low physical activity, some socio-demographic variables, such as low education and income, in addition to female sex and health variables would be associated with the highest risk of sarcopenia in the older adults.

Methods

The finite population sampling was used to calculate the sample size with a confidence level of 95%, an estimation error of 5%, and an expected ratio of 50%[16]. The participation of approximately 368 elderly people inserted in the 14 social groups was estimated, thus, requiring a minimum sample of 207 older adults by considering possible sample losses.

The older adults of both sexes engaged in social group activities were included through a project named 'active life'. Based on the researcher's perception and/or the participants' self-report, the individuals who had visual or hearing deficits that that could prevent participation in the study were excluded. The older adults who used walking gears, hip, knee or ankle prostheses or the ones who had undergone major surgeries less than three months before were also excluded.

Therefore, the sample consisted of 207 subjects. The sample of 207 elderly people was chosen intentionally and by convenience. The association analysis considered a statistical power of 80% and Odds Ratio (OR) of 1.3.

This study was approved by the Research Ethics Committee of the University Center named *Centro Universitário Metropolitano de Maringá* (UNIFAMMA) registered by the number 2.997.577/2018.

Data collection was carried out with 14 social groups that attend the older adults in the city of Sarandi, Paraná. Such groups were registered in the Department of Social Services of this city which involves all the sites that offer this kind of service. In this social groups, handcraft, dance, stretching, functional exercises, and singing activities are carried out.

Initially, the person responsible for each social group was contacted in order to obtain the authorization to perform the research, and then a list was requested with the schedule of the activities of each group. The older adults of the social groups were approached before or after the classes, so that they were informed about the procedures to which they would be submitted, and those who accepted to participate in the research signed a written informed consent form.

Before data collection, the researchers were trained and a pilot with 5 older adults was carried out.

The study was performed throughout 90 days. The first 60 days were used for data collection. The following items were evaluated: physical activity level, sedentary behavior, risk of sarcopenia, and the socio-demographic profile of the participants. The questionnaires were applied by interviewing the individuals so as to avoid possible reading errors by the participant; each each interview, on average, 10 min per participant.

A semi-structured questionnaire was created and applied by the authors to assess the sociodemographic, health and practice profiles of the groups' activities. This instrument consisted of questions related to the age group, education, marital status, smoking, length

of presence in the group, activities performed in the group, average income, retired or not, self-perceived health and perception in relation to older adults of the same age, use of medications, falls, situations of near falls, number of times they participate in group activities per week and self-reported diseases.

TThe physical activity level was measured by applying the short version of the International Physical Activity Questionnaire (IPAQ). Following the levels established by Matsudo et al[17].

SARC-f[18] was used in order to evaluate the risk of sarcopenia. This questionnaire includes five components: strength (if the individual could lift 5.5 lb), walking (if the individual could walk across a living room or in his/her bedroom), rising from a chair (if the individual could rise from a chair), climbing stairs (if the individual could climb a flight of 10 stairs) and falls (if the individual had fallen down in the past year). The scores range from zero to 2 points. Considering the first four components, this is the interpretation: zero = none, 1 = some and 2 = a lot or unable to perform the task. Regarding the last one, the score is: zero = no falls in the past year, 1 = 1-3 falls in the past year, and 2 = 4 or more falls in the past year. A total score of four or more points including the five components were risk of sarcopenia.

The analysis was performed by using a descriptive inferential statistics approach. The Chi-squared test was applied to investigate proportional differences in socio-demographic variables and health conditions based on the risk of sarcopenia. The Binary Logistic Regression (crude and adjusted analysis) was used to evaluate the associations of socio-demographic variables and health conditions (independent variables) with no risk of sarcopenia (dependent variable) of the older adults. For modeling the regression analysis, only the variables that showed a significance level equal to or less than 0.20 in the Chi-squared test were considered. The model adjustment was verified by using Hosmer-Lemeshow test. Considering the adjusted analysis, a hierarchical approach was adopted, following the backward procedure for introducing variables. A p-value lower than 0.20 was adopted as the criterion for the factor permanence in the adjusted regression analysis. Finally, a final regression model with only those variables of higher statistical significance was obtained. A significance level of $p < 0.05$ and a confidence interval (CI) of 95% by calculating the adjusted odds ratios were considered. In addition, a post hoc statistical power analysis in G*Power 3.1.9[19] revealed our statistical power to be 79.6% based on our sample of 207 participants, an Odds Ratio of 1.5, and a 0.05 *p* value. All analysis was conducted through SPSS 22.0 software.

Results

Older men and women (197 women and 10 men) participated in the survey, with a mean age of 66.32 ± 6.19 years. Note prevalence of older adults with a partner (59.4%), aged between 60 and 70 years (79.7%), monthly income of one minimum wage (75.8%), white (82,6%), retired (63.3%) and who do not currently smoke (67.6%). Regarding education, 37.2% reported incomplete primary education and 37.2% reported complete primary education.

Regarding the health profile of older adults who frequent social groups in the city of Sarandi, it was found that most older adults reported a good health perception (47.3%), perceived themselves with better health than older adults of the same age (70%), used two or more medications (43.5%), had no history of falls (63.8%), but had a history of almost falls in the last six months (67.6%).

In addition, 57.0% of the older adults have been attending social groups for more than three years and 86.0% have been attending groups two to three times a week. It was also found a prevalence of older adults with active level of physical activity (93.2%) and who do not present risk of sarcopenia (75.8%).

They observed that the majority of the older adults do not have heart disease (78.7%), stroke (89.4%), diabetes (76.3%), cancer (92.3%), osteoarthritis (68.1%), diseases lung (92.8%), depression (79.2%) and osteoporosis (82.1%), however, 55.6% of the participants reported having arterial hypertension.

According to the findings, the older adults do not perform vigorous activities (Md = 0.0), but perform light activities (Md = 4.0) and moderate activities (2.0) a few times a week. Specifically, there was a median of 60 and 180 min per day and per week of light physical activities, and 60 and 120 min of moderate physical activity per day and per week. Regarding sedentary behavior, the average was 240 minutes without sitting for a week and 360 minutes without a weekend. Further, it was found a median of 2.0 for the risk of sarcopenia.

When comparing the ratios of the socio-demographic variables according to the risk of sarcopenia (Table 1), a significant difference among the groups was found only regarding education (p = 0.016), indi-

cating that there is a higher proportion of older adults with no risk of sarcopenia with higher education level. Considering the other socio-demographic variables (p > 0.05), there was no significant difference among the groups.

When comparing the ratios of the health conditions according to the risk of sarcopenia (Table 1), there was a significant difference among the groups in self-perceived health (p = 0.001), health perception compared to older adults of the same age (p = 0.001), amount of medications used (p = 0.001), history of falls (p = 0.001) and near-falls (p = 0.001). These results seem to indicate a higher proportion of older adults with risk of sarcopenia who take more medicines (72.0%) and who have already had a history of falls (76.0%) and near falls (92.0%), whereas there is a higher proportion of older adults with no risk of sarcopenia with good self-perceived health (54.8%) and who perceived themselves as having better health than the older adults of the same age (76.4%).

When comparing the ratios of diseases reported according to the risk of sarcopenia (Table 2), there was a significant difference in heart disease (p = 0.001), systemic arterial hypertension (p = 0.001), stroke (p = 0.001), diabetes (p = 0.049), osteoarthritis (p = 0.001), lung disease (p = 0.034), depression (p = 0.001) and osteoporosis (p = 0.001). These results indicate a higher proportion of older adults with no risk of sarcopenia who reported no heart disease (85.4%), stroke (93.6%), diabetes (79.6%), lung disease (94.9), depression (95.4%) or osteoporosis (89.2%), whereas there is a higher proportion of older adults with risk of sarcopenia who reported having systemic arterial hypertension (72.0%) and osteoarthritis (60.0%).

When analyzing the association (crude and adjusted) related to no risk of sarcopenia with the socio-demographic variables and health conditions (Table 3), considering the crude analysis, a significant association was found (p < 0.05) with the self-perceived health, health perception compared to older adults of the same age, amount of medication, history of falls and near-falls, heart disease, systemic arterial hypertension, stroke, diabetes, osteoarthritis, lung disease, depression and osteoporosis.

When the analysis was adjusted for all variables (Table 4), they remained associated (p < 0.05) with no risk of sarcopenia, history of falls, heart disease, lung disease, depression or osteoporosis. It is noteworthy that the older adults who had no history of falls and reported

Table 1 – Comparison of the ratios of the sociodemographic and health variables of the older adults attending social groups in the city of Sarandi, Parana, Brazil, according to the risk of sarcopenia (n = 207).

Variables	Risk of sarcopenia		χ^2	p
	No (n = 157)	Yes (n = 50)		
	f (%)	*f* (%)		
Sex				
Male	9 (5.7)	1 (2.0)	1.144	0.284
Female	148 (94.3)	49 (98.0)		
Age group				
60 to 70 years of age	127 (80.9)	38 (76.0)	0.561	0.454
Over 70 years of age	30 (19.1)	12 (24.0)		
Marital Status				
Having a partner	97 (61.8)	26 (52.0)	1.505	0.220
Not having a partner	60 (38.2)	24 (48.0)		
Color				
White	129 (82.2)	42 (84.0)	0.089	0.766
Black	28 (17.8)	8 (16.0)		
Education				
Illitarate	14 (8.9)	9 (18.0)	3.936	0.048*
Incomplete elementary ed.	57 (36.3)	20 (40.0)		
Complete elementary ed.	61 (38.9)	16 (32.0)		
Complete high school	25 (15.9)	5 (10.0)		
Retirement				
Yes	97 (61.8)	34 (68.0)	0.631	0.427
No	60 (38.2)	16 (32.0)		
Monthly income				
1 to 2 minimum wages	114 (72.6)	43 (86.0)	3.711	0.054
Over 2 minimum wages	43 (27.4)	7 (14.0)		
Self-perceived health				
Good	86 (54.8)	12 (24.0)		
Regular	54 (34.4)	30 (60.0)	10.381	0.001*
Bad	17 (10.8)	8 (16.0)		
Health perception compared with other older adults				
Good	86 (54.8)	12 (24.0)		
Regular	54 (34.4)	30 (60.0)	10.381	0.001*
Bad	17 (10.8)	8 (16.0)		
Medication				
None	37 (23.6)	3 (6.0)		
1 to 2	66 (42.0)	11 (22.0)	20.165	0.001*
Over 2	54 (34.4)	36 (72.0)		
Falls				
Yes	37 (23.6)	38 (76.0)	45.125	0.001*
No	120 (76.4)	12 (24.0)		
Near-falls				
Yes	94 (59.9)	46 (92.0)	17.881	0.001*
No	63 (40.1)	4 (8.0)		
Time of physical activity				
Up to 1 year	45 (28.7)	21 (42.0)	3.544	
From 1.1 to 3 years	17 (10.8)	6 (12.0)		0.060
Over 3 years	95 (60.5)	23 (46.0)		
Weekly attendance				
Once	23 (14.6)	6 (12.0)	0.221	0.638
2 to 3 times	134 (85.4)	44 (88.0)		
Physical activity level				
Active	148 (94.3)	45 (90.0)	1.095	0.295
Poorly active	9 (5.7)	5 (10.0)		

*p < 0.05 = Chi-squared test for the ratios.

Table 2 – Comparison of the ratios of the diseases reported by the older adults attending social groups in the city of Sarandi, Parana, Brazil, according to the risk of sarcopenia (n = 207).

Variables	Risk of sarcopenia		χ^2	p
	No (n = 157)	Yes (n = 50)		
	f (%)	*f* (%)		
Heart Disease				
Yes	23 (14.6)	21 (42.0)	16.498	0.001*
No	134 (85.4)	29 (58.0)		
Systemic arterial hypertension				
Yes	79 (50.3)	36 (72.0)	7.220	0.007*
No	78 (49.7)	14 (28.0)		
Stroke				
Yes	10 (6.4)	12 (24.0)	12.410	0.001*
No	147 (93.6)	38 (76.0)		
Diabetes				
Yes	32 (20.4)	17 (34.0)	3.892	0.049*
No	125 (79.6)	33 (66.0)		
Cancer				
Yes	13 (8.3)	3 (6.0)	0.276	0.599
No	144 (91.7)	47 (94.0)		
Osteoarthritis				
Yes	36 (22.9)	30 (60.0)	23.995	0.001*
No	121 (77.1)	20 (40.0)		
Lung disease				
Yes	8 (5.1)	7 (14.0)	4.474	0.034*
No	149 (94.9)	43 (86.0)		
Depression				
Yes	23 (14.6)	20 (40.0)	14.808	0.001*
No	134 (85.4)	30 (60.0)		
Osteoporosis				
Yes	17 (10.8)	20 (40.0)	21.985	0.001*
No	140 (89.2)	30 (60.0)		

*p < 0.05 = Chi-squared test for the ratios.

having no heart disease, lung disease, depression or osteoporosis were more likely to have no risk of sarcopenia.

Discussion

The main findings of the present study are related to the fact that the older adults with higher education level, good self-perceived health, those who perceive themselves with better health than older adults of the same age, the ones with no history of falls or near-falls, nor heart disease, stroke, diabetes, lung disease, depression or osteoporosis had no risk of sarcopenia.

These results corroborate the strong relationship between good health, in general, and absence of diseases, in the specific case of sarcopenia. A recent population-based investigation showed that pre-sarcopenic and sarcopenic older adults are more frequently smokers with a higher

Table 3 – Factors associated with no risk of sarcopenia in the older adults attending social groups in the city of Sarandi, Parana, Brasil (n = 207).

Variables	OR gross [C.I 95%]	OR adjusted [C.I 95%]
Education		
Illiterate	1	1
Incomplete elementary	1.83 [0.68 - 4.88]	-
Complete elementary	2.45 [0.90 - 6.67]	-
Complete secondary	3.21 [0.89 - 11.49]	-
Monthly income		
1 to 2 minimum wages	1	1
Over 2 minimum wages	2.31 [0.96 - 5.54]	2,69 [0.86 - 8.42]
Self-perceived health		
Good	1	1
Regular	0.25 [0.11 - 0.53]*	-
Bad	0.29 [0.10 - 0.83]*	-
Health perception compared to other older adults		
Worse	1	1
Equal	1.70 [0.54 - 5.37]	-
Better	4.80 [1.64 - 14.00]*	-
Medication		
None	1	1
1 to 2	0.48 [0.12 - 1.85]	-
Over 2	0.12 [0.03 - 0.42]*	-
Falls		
Yes	1	1
No	10.27 [4.86 - 21.66]*	10.844 [4.156 - 28.294]*
Near-falls		
Yes	1	1
No	7.70 [2.64 - 22.47]*	3.39 [0.94 - 12.16]
Time of physical activity		
Up to 1 year	1	1
1.1 to 3 years	1.32 [0.45 - 3.83]	-
Over 3 years	1.92 [0.96 - 3.84]	-
Heart disease		
Yes	1	1
No	4.21 [2.06 - 8.62]*	2.76 [1.041 - 7.34]*
Systemic arterial hypertension		
Yes	1	1
No	2.53 [1.27 - 5.07]*	-
Stroke		
Yes	1	1
No	4.64 [1.86 - 11.55]*	-
Diabetes		
Yes	1	1
No	2.11 [1.00 - 4.06]*	-
Osteoarthritis		
Yes	1	1
No	5.04 [2.56 - 9.92]*	-
Lung disease		
Yes	1	1
No	3.03 [1.04 - 8.83]*	4.82 [1.021 - 22.80]*
Depression		
Yes	1	1
No	3.88 [1.89 - 7.96]*	4.28 [1.58 - 11.53]*
Osteoporosis		
Yes	1	1
No	5.49 [2.57 - 11.70]*	5.28 [1.93 - 14.39]*

* p < 0.05 = Binary Logistic Regression; OR = Odds Ratio; CI = Confidence interval; OR adjusted for all variables; regardless of the p value in the crude analysis.

history of hospitalization; they are less active and have a low quality diet, in addition to having worse physical condition and higher prevalence of fractures[20].

When assessing the self-perceived health of the older adults, it was seen that those who have sarcopenia take more medicines and have already had falls or near-falls. Stewart, Saunders and Greig[21] showed in their systematic reviews that regular physical exercise practice can effectively improve health, thus, increasing lean body mass and neuromuscular functions, and avoiding possible falls, as well as improving activities of daily living and self-perceived health.

Considering the correlation between chronic diseases and sarcopenia, it was seen that the older adults who do not report sarcopenia, do not report having chronic diseases either. On the other hand, there is a higher number of older adults who reported having sarcopenia and other chronic diseases, such as hypertension and arthritis. Therefore, regular physical exercise habits might be a protective factor for the control of sarcopenia and other chronic diseases[22]. In general, the inclusion of the older adults in physical activity programs has socialization as one of its central axes[23]. Thus, physical activity is not only limited to physiological but also psychological benefits, so that the older adults feel included in the group and, consequently, valued for practice[24].

The association between low education level and risk of sarcopenia found in the present study is corroborated by other researchers[25] in a population-based study with Brazilian older adults; an association possibly explained by the fact that low education level has been related to cases of malnutrition, which, in turn, could enhance the emergence of sarcopenia[26].

Regarding the practice of physical exercises, most of the participants included in this study were physically active, which did not allow a significant association to be found between the risk of sarcopenia and physical activity level, as found in other investigations[20,27-29]. The research by Confortin and collaborators[27], for example, showed that older women who become insufficiently active or remain insufficiently active over the years are more likely to have sarcopenia. Martinez et al.[29], after assessing 110 hospitalized older adults, found that the highest frequency of sarcopenia occurred in those who reported a low level of physical activity before being hospitalized. Other researchers found that physical inactivity was the indicator of sarcopenia most related to fragility in the older adutls[30].

The present study has some limitations. The SARC-f questionnaire is an instrument used only as an risk of sarcopenia, reasonably different from a more specialized technique, such as the dual-energy r-ray absorptiometry, widely used for the diagnosis of sarcopenia. This is a cross-sectional study, which makes it impossible to infer the mechanism of cause and effect among the associations found.

Finally, we conclude that social groups with high education level and health conditions reported by the participants of the present study are not associated with the risk of sarcopenia. It is worth mentioning that the older adults who did not report negative health conditions were more likely to have no indication of sarcopenia. The level of physical activity is not a factor associated with the indication of sarcopenia.

Conflict of interest

The authors declare no conflict of interest.

Author's contributions

Oliveira DV and Oliveira RF participated in the initial study design, writing, critical text review and data collection. Nascimento MA, Freire GLM and Oliveira RV were responsible for searching the literature and writing. Nascimento Júnior JRA and Bertolini SMMG participated in the critical review of the text.

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