Is the self-perception of the neighborhood environment associated with probable sarcopenia in the community of older adults?

A autopercepção do ambiente de vizinhança está associado à sarcopenia provável em idosos comunitários?

¿Estaría asociada la autopercepción del ambiente exterior con una probable sarcopenia en ancianos institucionalizados?

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ABSTRACT | The association of sarcopenia with sociodemographic and health factors has been previously presented in the literature. However, little is known about how environmental factors may be related to this condition. The study sought to verify the association between self-perception of a built neighborhood characteristics and probable sarcopenia in community-dwelling older adults. This was a cross-sectional study including 306 community-dwelling older adults of both genders. The outcome was probable sarcopenia, categorized with the time taken in the sit to stand test >15 seconds, as proposed by the European Working Group on Sarcopenia in Older People. The predictor variables were assessed using the neighborhood environment walkability scale (A-NEWS), which includes issues related to the infrastructure and security of the neighborhood, streets, sidewalks, and types of land use. Multivariate Logistic Regression analyses were performed. The presence of supermarkets/convenience stores/grocery stores/warehouses, open markets (OR: 0.45; 95%CI: 0.22-0.91) and bus stops (OR: 0.23; 95%CI: 0.10-0.50) were protective factors for probable sarcopenia. However, the accumulation of garbage and/or places with open sewage close to the residence (OR: 2.17; 95%CI: 1.16-4.05) were risk factors. There was a protective association of local businesses and bus stops near the place of residence for probable sarcopenia. However, the accumulation of garbage and/or places with open sewage near the residence proved to be risk factors for probable sarcopenia.

Keywords | Sarcopenia; Aging; Environment.

RESUMO | A associação da sarcopenia com fatores sociodemográficos e de saúde já foi previamente apresentada na literatura. Contudo, pouco se sabe sobre como os fatores ambientais podem estar relacionados a essa condição. O objetivo do estudo foi avaliar a associação entre a autopercepção do ambiente de vizinhança e a sarcopenia provável em idosos comunitários. Este é um estudo transversal, de base domiciliar com amostra probabilística, que incluiu 306 idosos comunitários de ambos os sexos. O desfecho foi a sarcopenia provável, categorizada com o tempo de realização no teste de sentar e levantar da cadeira >15 segundos, conforme proposto pelo *European Working Group on Sarcopenia in Older People*. As variáveis preditoras foram avaliadas de acordo com o *abbreviated neighborhood environment walkability scale* (A-NEWS), que inclui questões relacionadas à infraestrutura e à segurança do bairro, ruas, calçadas e tipos de uso do solo. Foram realizadas análises de regressão logística multivariada. A presença de supermercado/loja de conveniência/mercadinho/armazém, feira livre (OR: 0,45; IC 95%: 0,22-0,91) e ponto de ônibus (OR: 0,23; IC 95%: 0,10-0,50) foram

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fatores de proteção contra a sarcopenia provável. Já o acúmulo de lixo e locais com esgoto a céu aberto próximos à residência (OR: 2,17; IC 95%: 1,16-4,05) foram fatores de risco. Verificou-se uma associação de comércios locais e pontos de ônibus próximos ao local de residência para proteção contra a sarcopenia provável, enquanto o acúmulo de lixo e locais com esgoto a céu aberto próximos à residência se mostraram fatores de risco para a sarcopenia provável.

Descritores | Sarcopenia; Envelhecimento; Ambiente.

RESUMEN | La asociación entre sarcopenia y factores sociodemográficos y de salud se ha presentado previamente en la literatura. Sin embargo, es escasa la información sobre cómo los factores ambientales pueden relacionarse con esta condición. El objetivo de este estudio fue evaluar la asociación entre la autopercepción del ambiente exterior y una probable sarcopenia en ancianos institucionalizados. Este es un estudio transversal, de base domiciliaria con muestra probabilística, que incluyó a 306 ancianos institucionalizados de ambos sexos. El resultado fue una probable sarcopenia, categorizada con el tiempo necesario para sentarse y levantarse de una silla >15 segundos según lo propuesto por el Grupo Europeo de Trabajo en Sarcopenia en Personas Mayores. Las variables predictoras se evaluaron según el *abbreviated neighborhood environment walkability scale* (A-NEWS), que incluye temas relacionados con la infraestructura y seguridad del vecindario, calles, aceras y tipos de uso del suelo. Se realizó análisis de regresión logística multivariante. La presencia de supermercado/tienda de conveniencia/tienda/almacén, ferias (OR: 0,45; IC 95%: 0,22-0,91) y parada de autobús (OR: 0,23; IC 95%: 0,10-0,50) fueron los factores protectores contra una probable sarcopenia. La acumulación de basura y lugares con alcantarillado abierto cerca de la residencia (OR: 2,17; IC 95%: 1,16-4,05) fueron los factores de riesgo. Se encontró que las tiendas locales y paradas de autobús cercanas a la residencia estuvieron relacionadas a la protección contra una probable sarcopenia, mientras que la acumulación de basura y lugares con alcantarillado abierto cerca de la residencia estuvieron relacionados a una probable sarcopenia.

Palabras clave | Sarcopenia; Envejecimiento; Ambiente.

INTRODUCTION

Sarcopenia is a condition that leads to structural muscle changes, such as decreased strength, muscle mass and function, consequently leading to a greater risk of injuries and falls, increased rates of hospitalization and death, as well as a greater risk of functional incapacity[1]. In 2019, the European Working Group on Sarcopenia in Older People (EWGSOP2)[1] updated the diagnosis of probable sarcopenia, carried out through the assessment of muscle strength, via the handgrip strength or the five times sit to stand test (5XSST). The authors suggest that this strategy can identify sarcopenia early, enabling the implementation of more efficient intervention strategies[1].

The association between sarcopenia and sociodemographic and health factors has been presented in the literature[1]. However, little is known about how environmental factors can be related to this condition. Some studies found there is a relationship between self-perception of the neighborhood environment and various health outcomes, such as chronic diseases, occurrence of falls, limitations and functional incapacity[2,3]. Ribeiro et al.[4] found that older adults under the age of 75 years are more likely to fall in the environment outside their homes, usually in communities with less infrastructure, which have factors that affect their mobility, such as inadequate sidewalks and curbs, irregularities in the ground, slippery ground, poor lighting on the roads, and lack of signs. Also in this context, Wu et al.[2] described that urban design (street connectivity), and the decline of sidewalks affect the level of physical activity in the older population. Also on environmental issues, Li et al.[5] suggest that environmental factors such as uneven surfaces that are usually seen on sidewalks, curbs and streets contribute to falls, while Canever et al.[6] found an association between the living environment and fear of falling. Thus, all these conditions – decreased mobility, physical inactivity, history of falls and fear of falling – contribute to the development of sarcopenia[1].

Thus, it is necessary to understand the opportunities and deficiencies that the neighborhood environment can offer to the older community, since this population performs most of their activities in the community space in which they live. Environmental attributes, such as health clinics and community centers, recreational areas for sports, the presence of nearby places that offer adequate food, basic sanitation, in addition to public transport and safety options, can contribute to the functional capacity of the older population, as the infrastructure of the community influences the performance of active behavior[3,6,7].

However, there is no known direct association between self-perception of the neighborhood environment and probable sarcopenia in the older community. Thus, it is imperative to recognize the environmental risk factors associated with sarcopenia, in order to contribute to the proposition of targeted and anticipated interventions for the community so as to delay or even reverse this condition, which is so prevalent in older adults. Thus, this study sought to evaluate the association between self-perception of the neighborhood environment and probable sarcopenia in the older community.

METHODOLOGY

Study design

This was a household-based cross-sectional study with a probabilistic sample, using data extracted from the project "*Influência do nível de atividade física em testes de desempenho físico-funcional em idosos comunitários*" (Influence of the level of physical activity and physical-functional performance tests on the older community), in Balneário Arroio do Silva, Santa Catarina. The total resident population in 2010 was 9,586 inhabitants, of which 15.79% were older adults[8].

Population and sample

The calculation for finite samples was conducted based on the total number of older adults registered (n=2,833) in Basic Health Units (UBS) in the city in 2018. We estimated a prevalence for unknown outcomes equal to 50%, error of five percentage points and 95% confidence interval. Anticipating eventual sample losses, 540 older adults were considered eligible to compose the sample.

The selection of older adults was carried out by drawing lots without replacement, considering the representative proportion of the total number of older adults registered in each UBS. We included older residents of the community, aged ≥60 years, of both sexes and able to perform the 5XSST without the use of auxiliary devices. We excluded those who were bedridden, dependent, unable to answer the questionnaires, as well as those who were residents in long-term care facilities or who had changed their residential address. Older adults not located in their homes after three attempts made on different days and times were considered as losses, and those who did not accept to participate in the study were also considered as losses.

Dependent variable: probable sarcopenia

The diagnosis of probable sarcopenia was carried out as proposed by the EWGSOP2[1], applying the five times sit to stand test (5XSST). The 5XSST was conducted by measuring the time it took the older adult to sit down and stand up from a chair with their arms crossed over their chests, repeating the movement five times. Those who performed the five repetitions in a time >15 seconds were classified as having probable sarcopenia[1].

Predictor variables

Self-perception of the neighborhood environment

Self-perception of the neighborhood environment was assessed using the abbreviated neighborhood environment walkability scale (A-NEWS)[9], validated in Brazil[10]. In this study, we used the adapted version of the A-NEWS suggested by Salvador et al.[11]. This questionnaire assesses the perception of individuals in relation to different aspects of the environment – infrastructure, traffic and general security in the neighborhood – close to their home, considering the distance covered on foot from their home in up to 15 minutes. Each variable investigated was evaluated in a dichotomized way according to the response given by the volunteers (yes or no).

Control variables

Control variables were considered: age group (60-69 years, 70-79 years and 80 years and over); sex (female and male); income (0-1.5 minimum wages and ≥2 minimum wages); years of schooling (0-4 years, 5-8 years and 9 years or more); years of residence in the neighborhood (0-4 years, 5-9 years and 10 years or more); self-perceived health (very good/good, regular and poor/very bad); and presence of self-reported multimorbidity, characterized by the coexistence of two or more chronic diseases[12].

Statistical analysis

Data were collected and entered into the Statistical Package for the Social Sciences database (IBM®, Chicago, IL, USA), version 23.0. The level of significance was 5%. Categorical variables were described using absolute and

relative frequencies and their respective 95% confidence intervals (95% CI). To test the associations between predictor variables and probable sarcopenia, multivariate logistic regression analyzes were performed, estimating the crude and adjusted odds ratios (OR), with their respective confidence intervals (95% CI).

RESULTS

Among the 540 eligible older adults, 64 were excluded from the study due to change of address, 33 due to incomplete registration, 29 refusals, 84 losses and 24 due to death, totaling a sample of 306 older adults evaluated (Figure 1).

The description of the sociodemographic variables and the health conditions of the sample are presented in Table 1. Females made up 57.8% of the sample; also, the proportions of older people in the age groups of

60-69 years, 70-79 years and ≥80 years were 54.6%, 35.3% and 10.1%, respectively. Regarding health conditions, the prevalence of probable sarcopenia was 50.0%. Furthermore, 51.4% of the elderly with probable sarcopenia classified their health as regular and 86.9% presented multimorbidity.
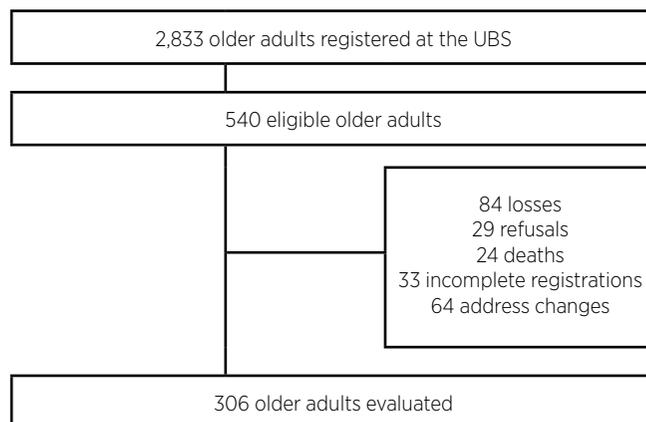

Figure 1. Representation of sample eligibility

Table 1. Description of sociodemographic variables and health conditions in the older community

Characteristics	Total sample (n=306)	No probable sarcopenia (n=153)	Probable sarcopenia (n=153)	p-value
Sociodemographic				
Age (years)				
60-69	167 (54.6%)	94 (61.4)	73 (47.7%)	
70-79	108 (35.3%)	49 (32.0%)	59 (38.6)	0.02*
≥80	31 (10.1%)	10 (6.5%)	21 (13.7%)	
Sex				
Female	178 (57.8%)	78 (44.3%)	98 (55.7%)	0.02*
Male	130 (42.2%)	75 (57.7%)	55 (42.3%)	
Income (minimum wages)				
0-1.5	219 (75.5%)	106 (75.2%)	113 (75.8%)	0.89
≥2	71 (24.5%)	35 (24.8)	36 (24.2%)	
Residence time in the neighborhood (years)				
0-4	62 (20.3)	33 (21.6%)	29 (19.1%)	
5-9	62 (20.3)	33 (21.6%)	29 (19.1%)	0.67
10	181 (59.4%)	87 (56.8%)	94 (61.8%)	
Health conditions				
Self-perceived health				
Good	116 (38.9%)	75 (49.3%)	41 (28.1%)	
Regular	133 (44.6%)	58 (38.2%)	75 (51.4%)	0.01*
Bad	49 (16.4)	19 (12.5%)	30 (20.5%)	
Multimorbidity				

(continues)

Table 1. Continuation

Characteristics	Total sample (n=306)	No probable sarcopenia (n=153)	Probable sarcopenia (n=153)	p-value
No	62 (20.3)	42 (27.5%)	20 (13.1%)	0.02*
Yes	244 (70.7%)	111 (72.5%)	133 (86.9%)	

*p<0.05: statistically significant.

The analysis of the association between the perception of the neighborhood environment and probable sarcopenia is presented in Table 2. In the adjusted analysis, it was observed that the presence of a supermarket, convenience store/grocery/warehouse, open market (OR: 0.45; 95% CI: 0.22-0.91) and bus stop (OR: 0 .23; 95% CI: 0.10-0.50) close to the older adult's place of residence were protective factors against probable sarcopenia, and those who noticed such characteristics had, respectively, 55% and 77% less chances of having probable sarcopenia when compared to the others. However, older adults who reported accumulation of garbage and open sewage near their homes were 2.17 times more likely (95% CI: 1.16-4.05) to have probable sarcopenia compared to those who did not live with the same problems in their neighborhoods.

Table 2. Multivariate logistic regression analysis between the perception of the living environment and the prevalence of probable sarcopenia in older community

Variables	Probable sarcopenia	
	Crude OR (95% CI)	Adjusted[a] OR (95% CI)
Supermarket, convenience store/grocery/warehouse, open market		
No	1.00	1.00
Yes	0.42 (0.21-0.83)*	0.45 (0.22-0.91)*
Commercial establishments		
No	1.00	1.00
Yes	0.85 (0.53-1.36)	0.95 (0.56-1.59)
Food establishments		
No	1.00	1.00
Yes	0.61 (0.37-1.02)	0.71 (0.41-1.23)
Health clinics and community centers		
No	1.00	1.00
Yes	0.83 (0.51-1.35)	1.03 (0.61-1.73)
Bus stops		
No	1.00	1.00
Yes	0.22 (0.10-0.47)*	0.23 (0.10-0.50)*
Parks, squares, walking paths, bike paths and/or sports courts		
No	1.00	1.00
Yes	0.80 (0.49-1.31)	0.88 (0.52-1.49)
Gyms/equipment for outdoor physical activity (gyms for older adults)		
No	1.00	1.00
Yes	0.65 (0.39-1.06)	0.63 (0.37-1.06)
Use of the outdoor gym for physical activity		
No	1.00	1.00
Yes	1.059 (0.381-2.947)	1.227 (0.370-4.070)
Gyms/bodybuilding and/or fitness centers		
No	1.00	1.00
Yes	0.64 (0.37-1.12)	0.70 (0.38-1.29)
Sidewalks on most streets		
No	1.00	1.00
Yes	0.86 (0.54-1.38)	0.91 (0.54-1.53)
Maintenance of the sidewalks		
No	1.00	1.00
Yes	0.84 (0.52-1.36)	0.81 (0.48-1.37)
Green area		
No	1.00	1.00
Yes	0.98 (0.61-1.57)	0.98 (0.59-1.62)

(continues)

Table 2. Continuation

Variables	Probable sarcopenia	
	Crude OR (95% CI)	Adjusted[a] OR (95% CI)
Flat streets		
No	1.00	1.00
Yes	0.95 (0.51-1.76)	1.02 (0.53-1.99)
Accumulation of garbage and/or places with open sewers		
No	1.00	1.00
Yes	2.07 (1.15-3.72)*	2.17 (1.16-4.05)*
Traffic as a barrier to walking or cycling		
No	1.00	1.00
Yes	0.94 (0.49-1.78)	1.04 (0.52-2.06)
Crosswalks, signs, or pedestrian overpasses		
No	1.00	1.00
Yes	0.95 (0.55-1.64)	1.02 (0.56-1.83)
Drivers respect pedestrians		
No	1.00	1.00
Yes	1.63 (0.61-4.35)	1.45 (0.41-5.05)
Street lighting		
No	1.00	1.00
Yes	1.04 (0.54-2.00)	1.01 (0.50-2.02)
Daytime safety for walking		
No	1.00	1.00
Yes	0.42 (0.21-0.84)*	0.54 (0.26-1.11)
Overnight security for walking		
No	1.00	1.00
Yes	0.66 (0.39-1.11)	0.81 (0.46-1.41)
High level of crime		
No	1.00	1.00
Yes	1.43 (0.88-2.33)	1.22 (0.73-2.03)

[a]Adjusted for the variables sex, age, length of residence in the neighborhood, years of education, self-perceived health and multi-morbidity; *p≤0.05: statistically significant.

DISCUSSION

The main results of this study showed that the presence of supermarkets, convenience stores, grocery stores, warehouses, open markets and a bus stop close to the place of residence were protective factors against probable sarcopenia. On the other hand, older adults who lived close to places with accumulation of garbage and open sewers were more likely to have this condition.

Studies indicate that living in environments with precarious conditions can be harmful to health; however, there are few studies focusing on the relationship between the characteristics of the neighborhood environment and the presence of negative health outcomes in the older population[2,13]. It is known that the prevalence of sarcopenia increases with advancing age, being a crucial factor for detecting the disease in its early stages[14]. Thus, it is imperative to carry out interventions in advance regarding possible risk factors for sarcopenia, such as the physical and social environment in which the older adult is inserted, as this can positively affect the individual's health and well-being.

The influence of environmental factors on the health of the older adults must be evaluated, as this population is the one that spends the most time at home or in community areas[15]. Improvements in the environment, such as sidewalks, paths or inaccessible streets, are factors that influence the social participation of this population[16]. Twardzik et al.[17] found that the probability of the older adults going to the neighborhood less than once a week was higher (OR: 1.65; 95% CI: 1.38-1.98) when the neighborhood environment did not have sidewalks or had poorly maintained sidewalks, regardless of demographic, socioeconomic and activity limitations. Balfour and Kaplan[18] concluded that poor quality neighborhood environments increased by 2.23 times (95% CI: 1.08-4.60) the chances of low physical function in the older adults. These results corroborate the study, since the loss of physical function is related to the decrease in the strength of the lower limbs and, consequently, the increase in the older adult's chances of developing probable sarcopenia.

Prevention strategies involving the practice of physical exercise, especially resistance exercises, associated with good nutrition, are recommended for older adults with sarcopenia,

as they impact muscle protein synthesis in this population[19]. García-Esquinas et al.[20] point out that older adults tend to have difficulties in accessing adequate food when they encounter barriers outside the home. Thus, local businesses provide a more nutritious diet and a more active routine for the older population, as they are a stimulating factor and facilitate access to necessary and good quality food[21]. The proximity of local businesses provides more regular walks, as shopping areas encourage walks. Large distances between homes and commercial establishments, on the other hand, negatively influence the walking frequency of older adults[22].

Another important factor for preventing sarcopenia is the presence of bus stops near the homes of the older population. The possibility of getting around by public transport facilitates access to basic services that guarantee the supply of their needs, in addition to favoring social interaction[15]. Dahan-Oliel et al.[23] suggest that walking and using public transport require high cognitive and physical skills, leading to greater participation in the community. In addition, older people tend to use public transport more often in carrying out their daily tasks than younger people[22]. Facilitating access to public transport can be a factor in maintaining the functional independence of these individuals, contributing to protection against probable sarcopenia.

The deterioration of the physical environment, such as the accumulation of garbage and the lack of local infrastructure, may be related to the restriction of older adults to their homes[24], being a risk factor for the development of sarcopenia, as it does not encourage the individual to take walks or physical activities outdoors. Older adults who have higher levels of physical activity positively assess both their physical, mental and social health and the environment in which they live, proving the impact of these factors on their quality of life[25].

Despite the relevance of the study results, they must be interpreted within the context of its design. Longitudinal studies need to be carried out in order to understand the influence of environmental factors on the development of sarcopenia. Furthermore, it should be noted that despite the A-NEWS being a subjective measurement instrument and having been developed with a focus on the practice of physical activity, its use has been frequently associated with other important outcomes in the physical health of the older population, especially because it is a low-cost, easy-to-apply method. Thus, it is believed that the results found may help to identify environmental risk factors related to the presence of probable sarcopenia in the older community.

CONCLUSION

We concluded there is an association between the presence of local businesses and bus stops close to the place of residence to protection against probable sarcopenia. On the other hand, places with accumulation of garbage and open sewers close to the residence proved to be risk factors for the development of probable sarcopenia in the sampled older community. These findings are important for health professionals to have greater knowledge about the environmental factors that need to be considered to effectively prevent probable sarcopenia in the older population, enabling interventions that benefit the entire community.

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