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Research Article

Health habits, lifestyles, and comorbidities associated with sarcopenia in the older people

Hábitos de salud, estilos de vida y comorbilidades asociadas a la sarcopenia en las personas mayores

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ABSTRACT

Introduction: Sarcopenia is a loss of muscle mass and function that affects the elderly and impairs their quality of life.

Objective: To establish the association between sarcopenia, health habits, lifestyles, and comorbidities in older adults.

Methods: Adopting a quantitative, descriptive-correlational, and observational cross-sectional design, the research involved 65 participants aged over 60 (71.83±7.31). To assess health habits, lifestyles, and comorbidities, questionnaires addressed alcohol consumption, smoking, physical activity levels, sedentary behavior, and history of peripheral vascular disease, acute myocardial infarction, type 2 diabetes mellitus, high blood pressure, high cholesterol, and pain. Sarcopenia was evaluated using criteria from the European Working Group on Sarcopenia in Older People (EWGSOP2). Chi-Square test was used to associate the presence of sarcopenia with health habits, lifestyles, and comorbidities.

Results: Revealed a significant association between sarcopenia and type 2 diabetes mellitus (p= 0.002), physical activity level (p= 0.004), and sedentary behavior (p= 0.001). Conversely, no significant associations were found between sarcopenia and acute myocardial infarction (p= 0.356), peripheral vascular disease (p= 0.098), high blood pressure (p= 0.724), hypercholesterolemia (p= 0.653), smoking habit (p= 0.267), alcohol consumption (p= 0.674), upper limb pain (p= 0.343), lower limb pain (p= 0.260), or spine pain (p= 0.418).

Conclusions: That there is a significant association between sarcopenia and diabetes mellitus type 2, physical inactivity, and sedentary behavior in older people.

Keywords: aged; frail elderly; muscle atrophy; physical condition; quality of life.

RESUMEN

Introducción: La sarcopenia implica la pérdida de masa y función muscular, lo cual afecta a a personas mayores y deteriora su calidad de vida.

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Objetivo: Establecer la asociación entre sarcopenia, hábitos de salud, estilos de vida y comorbilidades en adultos mayores.

Métodos: Se utilizó un diseño cuantitativo, descriptivo-correlacional, participaron 65 personas mayores de 60 años (71.83 ± 7.31). Se evaluaron hábitos de salud, estilos de vida y comorbilidades, se usaron cuestionarios sobre consumo de alcohol, tabaquismo, niveles de actividad física (NAF), comportamiento sedentario y afecciones como enfermedad vascular periférica, infarto agudo de miocardio, diabetes tipo 2, hipertensión, hipercolesterolemia y dolor. La sarcopenia se evaluó según los criterios del Grupo Europeo de Trabajo sobre Sarcopenia en Personas Mayores (EWGSOP2). Se utilizó la prueba de *ji* cuadrado para asociar la presencia de sarcopenia con hábitos de salud, estilos de vida y comorbilidades.

Resultados: Mostraron una asociación significativa entre sarcopenia y diabetes tipo 2 (p= 0,002), (NAF) (p= 0,004) y comportamiento sedentario (p= 0,001). No se encontraron asociaciones significativas con infarto agudo de miocardio (p= 0,356), enfermedad vascular periférica (p= 0,098), hipertensión (p= 0,724), hipercolesterolemia (p= 0,653), tabaquismo (p= 0,267), consumo de alcohol (p= 0,674), dolor en extremidades superiores (p= 0,343), dolor en extremidades inferiores (p= 0,260) o dolor en la columna vertebral (p= 0,418).

Conclusión: La sarcopenia en adultos mayores se asocia significativamente con la diabetes tipo 2, la inactividad física y el comportamiento sedentario.

Palabras clave: anciano frágil; atrofia muscular; envejecimiento; calidad de vida; condición física.

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INTRODUCTION

Life expectancy has increased and consequently has caused a sustained increase in the number of older people globally.[1] In this context, it has been projected that the elderly population will double by the year 2050, with an estimated global total of 22%, while in Chile it is estimated that the percentage of older


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people will evolve from 19% to 21.6% by the year 2050.[2] The aging process constitutes a life cycle stage that begins at age 65 and ends with death.[3] During this period, the body experiences individual and natural changes in the different systems that make it up.[4,5] One notable change commonly observed in older individuals is the gradual decline in muscle mass, accompanied by diminishing strength and reduced physical capabilities, often leading to the onset of sarcopenia.[6,7,8]

Sarcopenia is a geriatric syndrome that increasingly affects older people, affecting their physical condition and quality of life.[9,10] Factors that could be involved in the development of sarcopenia are physical inactivity, malnutrition, smoking, and alcohol consumption, which could trigger deterioration and both muscular and functional limitations.[11,12] It has been reported that adopting healthy habits and lifestyles that promote a varied and nutritionally balanced diet, as well as physical activity appropriate to the functional characteristics of each person, are determining factors in the prevention and development of sarcopenia.[13,14,15]

To confirm a diagnosis of sarcopenia, the presence of loss of muscle mass, decreased strength, and poor physical performance are evaluated, where older people must have lower muscle mass added to decreased strength and/or poor physical performance.[7] The conditions that occur after a diagnosis of sarcopenia are multiple since they range from physical disability, problems in the daily development of basic activities of daily living, decreased walking speed, and loss of functionality and independence.[12,16] It is possible that this may constitute a public health problem.

The scientific evidence that associates sarcopenia with lifestyles, health habits, and comorbidities such as alcohol habits, smoking, high blood pressure, hours of sleep, and physical activity is limited and controversial in older people. A study by *Steffl M* et al.,[17] reported that there is no association between the presence of sarcopenia and alcohol habits in older people. Another investigation observed that risk factors such as smoking, alcohol consumption, presence of high blood pressure, obesity, and cognitive impairment were associated with the presence of sarcopenia.[18] Therefore, conducting research that associates health habits with sarcopenia would be relevant to clarify these controversies.

According to what was previously stated, the purpose of this study was to establish the association between sarcopenia with health habits, lifestyles, and comorbidities in older people.


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METHODS

Study design

This research has an observational cross-sectional design. The sample corresponds to 65 participants over 60 years of age from the city of Talca, Chile. Participants were selected through non-probabilistic convenience sampling. The following were excluded: a) elderly people in a dependent condition according to the functional examination of the elderly (EFAM Chile),[19] institutionalized or with the use of technical aids for their movement, b) elderly people with musculoskeletal injuries, such as tears, fractures, sprains, dislocations, with less than 6 months of evolution that prevents the performance of any of the tests, c) older people at risk of cognitive deterioration (equal or lower score in Mini-Mental State).

Variables

Age, Weight, Height, Body mass index, Alcohol consumption, Smoking habit, Comorbidities and pain, Physical activity level, Sedentary behavior, Hand grip strength, Appendicular muscle mass, Walking speed, and Sarcopenia were collected.

Questionnaires and surveys were used to collect data on health habits and comorbidities. The questioning used was the Alcohol Use Disorders Identification Test (AUDIT), while to determine the smoking habit, the presence of comorbidities, and pain, questions from the Chilean National Health Survey 2016-2017 were used.[20]

Procedures

Prior to the evaluations, the age, weight, height and body mass index (BMI) of the participants were recorded. Bipedal height was assessed using a stadiometer (Seca® Hamburg, Germany; accuracy 0.1 cm) and body weight with a digital scale (Seca® Hamburg, Germany; accuracy of 1 kg). The BMI was calculated with both measurements, dividing body weight (kg) by bipedal height squared (m^2).

Alcohol consumption

To assess alcohol consumption, the Alcohol Use Disorders Identification Test (AUDIT) was employed. This test comprises 10 questions, each with five response options (scored on a scale from 0 to 4 points).


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Participants scoring between 0-7 points were classified as non-drinkers, while those who scored above 8 points were categorized as having an alcohol habit deemed potentially hazardous to their health.[21]

Smoking habit

To determine smoking habits, questions based on the minimum tobacco surveillance instrument of the Pan American Health Organization were considered. This instrument consists of 3 questions, where the third question is the one that allows categorizing the person as "presence" and "non-presence" of smoking habit (do you currently smoke cigarettes?).

Presence of comorbidities and pain

The presence of comorbidities was obtained through questions from the Chilean National Health Survey 2016-2017, which asked about morbid antecedents such as acute myocardial infarction, peripheral vascular disease, type 2 diabetes, arterial hypertension and high cholesterol. Pain was measured by questions from this survey that specified the area (upper limb, lower limb and spine). The answer options for each question were "YES" or "NO", allowing the individuals to be classified with the "presence" and "non-presence" of these antecedents.

Lifestyle: Physical activity level and sedentary behavior

To evaluate the physical activity level (PAL) and sedentary behavior, the Global Physical Activity Questionnaire (GPAQ) was used.[22] The indicator of total physical activity was expressed continuously in METs (Metabolic-energy-equivalents) and the results were dichotomized into “physically inactive” when energy expenditure was ≤ 599 METs/min/week and “physically active” when energy expenditure was ≥ 600 METs/min/week.[23] Sedentary behavior was considered when the participants spent ≥ 4 hours a day carrying out activities sitting down, as has been noted in other studies in the Chilean population.[24,25]

Hand grip strength

The physical evaluation began with the evaluation of strength through manual grip of the upper limb through a dynamometer (Jamar® PC 5030 J1, Sammons Preston Rolyan, USA). The optimal position to carry out the test correctly was explained to the elderly people, which consisted of a sitting position with a straight back, arms abducted, and elbow bent at 90 °.[26] The evaluation was carried out with the


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dominant arm having 3 attempts with corresponding rest between attempts to mark the maximum handgrip strength for 3 seconds.

Muscle mass

The anthropometric methods to assess appendicular muscle mass (AMM) were weight, height, hip circumference, calf circumference, and knee height. In the first instance, body weight was measured with a digital scale (Seca® Hamburg, Germany; precision of 1 kg). Height was assessed bipedally using a stadiometer (Seca® Hamburg, Germany; precision 0.1 cm). For hip and calf circumference, a tape measure (Sanny®, Brazil; precision of 0.1 mm) was used. For hip circumference, the participant had to stand, and the measuring tape was placed, parallel to the floor, at the level of its maximum circumference without compressing the soft tissues (buttocks). For the calf circumference, the measurement was carried out with the feet apart and distributing the weight on both feet, in which the maximum circumference of the dominant leg was sought. Knee height was measured with the subject seated using a wide-bladed knee caliper. Measurements were made on the left leg, placing the knee and leg at a 90-degree angle. To calculate the AMM, the equation proposed by *Lera M* et al.,[27] was used. The result was normalized by dividing the MMA by the squared bipedal height, this final value being used in the analysis and corresponding to the appendicular muscle mass index (AMMI).

Walking speed

To evaluate physical performance, the 3-meter walking speed test was used, which determines the walking speed of older people. The test was carried out on flat terrain in an enclosed area and 3 meters were marked on the ground using cones.[28] The older people started walking at least 1 meter beforehand at a normal and/or everyday speed where the researchers took the time it took to walk the 3 demarcated meters.[28] The test was performed 3 times and the shortest time achieved was considered.

Sarcopenia

From the tests carried out, the AMMI, muscle strength, and physical performance were obtained. Therefore, sarcopenia was determined through the criteria and cut-off scores proposed by the European consensus for the definition and diagnosis of sarcopenia, where participants have a decrease in muscle mass in conjunction with a decrease in muscle strength. and/or physical performance will be classified with the presence of sarcopenia.[29]


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Statistical analysis

The data were analyzed with SPSS 25.0 for Windows (IBM, IL, USA). The characterization data of the studied population are presented as mean and standard deviation for continuous variables and as a percentage for categorical variables. The Chi-Square test was used to associate the presence of sarcopenia with health habits, lifestyles, and comorbidities. The significance level used was $p< 0.05$.

Bioethical issues

This study adheres to international ethical guidelines, such as the Declaration of Helsinki, as well as university ethical standards. All participants read and voluntarily signed an informed consent. The research was approved by the ethics committee of the Santo Tomás University, Chile (code 18.20).

RESULTS

General characteristics of the sample

The sample was made up of 65 older people from the city of Talca, Maule region. Table 1 shows the anthropometric characteristics of the older adults evaluated.

Table 1 - General characteristics of the sample

Variables	Min	Max	Mean	SD
Age (years)	60.00	94.00	71.83	7.31
Weight (kg)	53.00	101.00	74.13	11.91
Height (m)	1.42	1.84	1.59	0.80
BMI (kg/m^2)	20.08	43.33	29.19	4.58

SD: standard deviation; BMI: body mass index.

Prevalence of sarcopenia, health habits, lifestyles, and comorbidities

Table 2 shows the variables evaluated along with their percentage of presence or absence in the samples. According to the results obtained, it was established that 29.2% of older adults met the criteria to be

categorized as having sarcopenia. On the other hand, a high rate of older people was observed presenting physical inactivity, alcohol habit, and lower limb pain, mainly.

Table 2 - Prevalence of sarcopenia, health habits, lifestyles, and comorbidities

Variables	Presence of the variable (%)	
	YES	NOT
Sarcopenia	29.2	70.8
History of AMI	3.1	96.9
PVD	9.2	90.8
DM type 2	30.8	69.2
High blood pressure	49.2	50.8
High cholesterol	27.7	72.3
Smoking habit	12.3	87.7
Alcoholic habit	53.8	46.2
Upper limb Pain	38.5	61.5
Lower limb Pain	52.3	47.7
Spine Pain	44.6	55.4
Physical inactivity	69.2	30.8
Sedentary behavior	43.1	56.9

AMI: acute myocardial infarction; PVD: Peripheral vascular disease; DM: diabetes mellitus. *: p< 0,05.

Association between sarcopenia with health habits, lifestyles, and comorbidities

Table 3 shows the association between the presence of sarcopenia with health habits, lifestyles, and comorbidities, in which a significant association was established between the presence of sarcopenia and the variables type 2 diabetes mellitus (p= 0.002), physical inactivity (p= 0.004) and sedentary behavior (p= 0.001).

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Table 3 - Association between sarcopenia and health habits, lifestyles, and comorbidities

Variables	Sarcopenia (%)	Not sarcopenia (%)	*p* value
History of AMI	0.0	13.0	0.098
PVD	57.9	19.6	0.002*
DM type 2	52.6	47.8	0.724
High blood pressure	31.6	26.1	0.653
High cholesterol	5.3	15.2	0.267
Smoking habit	57.9	52.2	0.674
Alcoholic habit	47.4	34.8	0.343
Upper limb Pain	63.2	47.8	0.260
Lower limb Pain	36.8	47.8	0.418
Spine Pain	5.3	41.3	0.004*
Physical inactivity	78.9	28.3	0.001*

AMI: acute myocardial infarction; PVD: Peripheral vascular disease; DM: diabetes mellitus. *: p< 0,05.

DISCUSSION

The aim of the research was to establish the association between sarcopenia, health habits, lifestyles, and comorbidities in older adults The main results of this research indicate that there is an association between the presence of sarcopenia with type 2 diabetes mellitus, physical inactivity, and sedentary behavior in the elderly people evaluated. Similar results have been reported by previous research.[30,31] *Gianoudis J* et al.,[30] found that at older ages in older people, there is an association between sarcopenia and lower lean body mass, muscle function, and muscle strength. The research by *Casals-Váquez C* et al., [31]


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reported that the presence of sarcopenia is higher in men compared to women (p= 0.022) and prevails as age advances (p= 0.002).

One of the main findings of current research indicates that physical inactivity is linked to the presence of sarcopenia in older people. Physical inactivity has been identified as one of the main risk factors for sarcopenia.[32] People with insufficient levels of physical activity have been shown to have a 20% to 30% higher risk of mortality compared to those who maintain adequate levels of physical activity.[16] Concerning sarcopenia, *Steffl M* et al.,[17] in their meta-analysis, reported that older people who engaged in a certain amount of physical activity were less likely to develop sarcopenia, regardless of the type of exercise performed. Likewise, it has been observed that older people with sarcopenia have a low NAF (p< 0.022) along with poor dietary intake (p< 0.001).[31] It has also been shown that physical activity and exercise act as countermeasures against sarcopenia. Furthermore, at older ages, physical inactivity is recognized as an important factor that contributes to sarcopenia and possible loss of autonomy in older people.[31] According to the literature and our results, the association between physical inactivity and the presence of sarcopenia appears to be quite strong.

This study also identified an association between sarcopenia and sedentary behavior. Previous studies have reported a high prevalence of sedentary behaviors in the elderly population. It has been demonstrated that older individuals who engage in sedentary behaviors for more than 120 minutes per day are 30% more likely to develop sarcopenia.[34] Similarly, *Tzeng PL* et al.,[35] demonstrated that older people who report sitting for ≥ 7 hours per day have a higher risk of sarcopenia.[35] In general, the data are categorical, as the majority of older people over the age of 65 are retired or in the process of retirement, which increases the probability of acquiring sedentary behaviors.

Another condition that was associated with sarcopenia in our research is type 2 diabetes mellitus. Previous research has associated sarcopenia with type 2 diabetes mellitus in elderly patients.[31,36,37] It has been noted that the presence of type 2 diabetes mellitus increases the probability of having sarcopenia in older people by 50%, increasing mortality.[36] In the present study, 57.9% of older people with sarcopenia had type 2 diabetes mellitus, a percentage higher than that reported in elderly from an Amazonian region in Brazil, which showed a prevalence of sarcopenia of 9.4% in older people with type 2 diabetes mellitus.[37]


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Concerning some health habits such as alcohol and smoking habits, current research did not report an association between these variables. Previous evidence is controversial, *Locquet M* et al.,[38] in a 5-year longitudinal investigation, reported that 35.9% of smokers developed sarcopenia, compared to 16.8% of non-smokers.[38] In another investigation, 12 articles with 22,515 subjects were analyzed, where they reported that cigarette smoking could have a relatively small impact on the development of sarcopenia.[39] Regarding the alcohol habit, a meta-analysis that included 13 articles with 13,155 subjects concluded that the alcohol habit does not have sufficient evidence to be classified as a promoter for the development of sarcopenia.[39] Although these findings do not support that smoking and alcohol habits independently are a factor in the development of sarcopenia, more long-term studies are needed, since dependence on both habits has the potential to accelerate the loss of muscle mass and hence the development of sarcopenia.[40]

These findings underscore the significance of disease prevention, as they can delay the deterioration of older adults. Furthermore, the importance of adopting healthy lifestyles at all stages of life is evident, as they can positively influence the condition and quality of life of the elderly. It is recommended that public health professionals promote the practice of physical activity, exercise, and health education among the elderly, with particular attention to the specific sedentary behaviors that are typical of their stage of life. This research is limited by the type of sampling used, the small sample size (n= 65), and the use of self-report questionnaires, which may underestimate or overestimate the results of the variables being quantified. Additionally, the indirect calculation of skeletal muscle mass through anthropometric parameters may be a limitation. Nevertheless, the utilization of validated and extensively utilized questionnaires and physical assessment tests in this study serves to alleviate these concerns, while simultaneously functioning as efficacious public health tools.

In conclusion, this study indicated a significant association between sarcopenia, physical inactivity, sedentary behavior, and type 2 diabetes mellitus in older people.


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Conflict of interest

The authors have no conflicts of interest.

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Data Availability Statement

The study data are considered confidential by the authors, so they cannot be published or shared publicly; they are stored in a private repository by the authors, and access to them requires their permission.