



Original

The relationship between sarcopenia, undernutrition, physical mobility and basic activities of daily living in a group of elderly women of Mexico City

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Abstract

Background: Sarcopenia is a geriatric syndrome, which affects the functional status and mobility of individuals.

Objective: To identify the prevalence of sarcopenia and undernutrition, and to assess the association between sarcopenia and mobility, and sarcopenia and basic activities of daily living (ADL) in a group of elderly women.

Subjects and methods: A cross-sectional study was performed in patients attending a geriatric service at a government hospital in Mexico City. Sarcopenia was identified applying Baumgartner's equation by obtaining skeletal muscle mass index (SMI) and undernutrition was diagnosed using mini-nutritional assessment instrument (MNA). The SENECA questionnaire and Katz index were used to evaluate mobility and ADL, respectively. Statistical analysis: lineal regression models were constructed fitting SMI as a dependent variable and SENECA, and ADL scores as independent variables, adjusted for age.

Results: 90 women with a mean age of 78.2 (\pm 6.8) were studied. Undernutrition was identified in 15.5% of the patients. The prevalence of sarcopenia was 41.1%. Patients with sarcopenia presented a high prevalence of undernutrition ($p < 0.001$). Sarcopenia was associated with difficulty in climbing stairs (OR = 2.63, $p = 0.03$), adjusted for age. The mobility score was associated with sarcopenia, in the group without sarcopenia the mean score was 16.3, and with sarcopenia it was 18.3, ($p = 0.04$). Regarding ADL, 64.9% of the patients with intermediate independence and dependence had sarcopenia, while 35.1% with total independence presented sarcopenia ($p < 0.001$).

Conclusions: The elder women with sarcopenia had a higher prevalence of undernutrition. Sarcopenia was associated with difficulties in mobility, particularly difficulties in climbing stairs.

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Key words: Sarcopenia. Undernutrition. Mobility limitation. Activities of daily living.

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RELACIÓN ENTRE SARCOPENIA, DESNUTRICIÓN, MOVILIDAD FÍSICA Y ACTIVIDADES BÁSICAS DE LA VIDA DIARIA EN UN GRUPO DE ANCIANAS DE LA CIUDAD DE MÉXICO

Resumen

Antecedentes: La sarcopenia es un síndrome geriátrico que afecta el estado funcional y la movilidad de los ancianos.

Objetivo: Identificar la prevalencia de sarcopenia y desnutrición, y evaluar la asociación entre sarcopenia y movilidad, y sarcopenia y actividades básicas de la vida diaria (ABVD), en un grupo de mujeres ancianas.

Sujetos y métodos: Un estudio de corte transversal, fue llevado a cabo en pacientes que asistían a un servicio de geriatría en un hospital público en la ciudad de México. La sarcopenia fue identificada aplicando la ecuación de Baumgartner para obtener el índice de masa muscular esquelética apendicular (IMEA) y la desnutrición fue diagnosticada usando la evaluación mínima del estado de nutrición (MNA). El cuestionario de SENECA y el índice de Katz fueron usados para evaluar movilidad y ABVD, respectivamente. Análisis estadístico: un modelo de regresión lineal fue construido usando IMEA como variable dependiente y SENECA, y la calificación de ABVD como variables independientes, ajustado por edad.

Resultados: 90 mujeres con un promedio de edad de 78,2 (\pm 6,8) años fueron estudiadas. La desnutrición fue identificada en 15,5% de las pacientes. La prevalencia de sarcopenia fue de 41,1%. Las pacientes con sarcopenia presentaron una alta prevalencia de desnutrición ($p < 0,001$). La sarcopenia se asoció con dificultad para subir escaleras (OR = 2,63, $p = 0,03$), ajustada por edad. La movilidad se asoció con sarcopenia; en el grupo sin sarcopenia el promedio de la escala fue 16,3, y con sarcopenia 18,3, ($p = 0,04$). En relación a ABVD, 64,9% de las pacientes con independencia intermedia/dependencia tenía sarcopenia, mientras que 35,1% con independencia total presentó sarcopenia, ($p < 0,001$).

Conclusiones: Las pacientes con sarcopenia tenían una mayor prevalencia de desnutrición. La sarcopenia se asoció con dificultad para la movilidad, particularmente subir escaleras.

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Palabras clave: Sarcopenia. Desnutrición. Movilidad. Actividades de la vida diaria.

Abbreviations

ADL: Activities of daily living.
ASM: Appendicular skeletal muscle mass.
BMI: Body mass Index.
CC: Calf circumference.
EWGSOP: European Working Group on Sarcopenia in Older People.
MNA: Mini-Nutritional Assessment.
MAMC: Mid-arm muscle circumference.
MUAC: Mid-upper arm circumference.
SENECA: Survey in European on Nutrition and the Elderly: a Concerted Action (Physical Mobility).
SMI (kg)/height² (m²): skeletal muscle mass index.

Introduction

Sarcopenia is a common clinical condition among elderly people. It is a syndrome characterized by progressive and generalized loss of skeletal mass, strength, and muscle function.¹ Sarcopenia is associated with weakness, loss of independence, disability, higher risk of falls, and also, a decrease in quality of life.^{2,3,4} The significant clinical impact of sarcopenia and its high costs both direct and indirect that this condition generates, in an aging society, emphasizes the need of health care systems to focus on this geriatric syndrome.⁵⁻⁷

The epidemiological data available indicates that the prevalence of sarcopenia varies widely, this variation is not only related to the population being studied, but also for the diagnostic criteria that is selected by the researchers.⁵⁻⁷ The study known as Rosetta, compared the muscle mass distribution of young versus elderly people and it was one of the first reports that showed a decrease in skeletal muscle mass with aging.⁸ Data from this study has been used as a reference for defining the cut-off point of the skeletal muscle mass index (SMI), which is the value of SMI corresponding to < 2 SD in young adults.⁹ Considering the results of the Rosetta study, Baumgartner et al.,⁹ developed an equation to estimate both the appendicular skeletal muscle mass (ASM) and the relative appendicular skeletal muscle mass index [ASM (kg)/height (m²)]. The decline in SMI is associated with the reduction of muscle strength, which in turn is a good predictor of functionality.¹⁰ Skeletal muscle mass is a vital tissue that must be preserved, particularly in the elderly, in order to avoid serious consequences in the nutritional and health status of this group.^{11,12} Clinical and epidemiological studies have shown that there is a decrease in food intake in older adults; they eat less and have a poor diet, which increases the risk of undernutrition.¹² A negative feedback mechanism takes place and undernourished elders become sick more often, and sick elders become undernourished with greater frequency.¹³ The prevalence of undernutrition is higher in institutionalized elderly patients as compared with community-dwelling elders.¹⁴ In Mexico, undernutrition in elderly

people is a common finding in hospital settings.^{15,16} Only a few studies on sarcopenia have considered the association of this condition with undernutrition, mobility, and activities of daily living (ADL).¹⁷ The aim of this study was to identify the prevalence of sarcopenia and undernutrition, and to assess the association between sarcopenia and mobility, as well as sarcopenia and ADL in a group of Mexican elderly women.

Materials and methods

A cross sectional study was carried out in patients attending a geriatric outpatient service of a government public hospital in southern Mexico City. Female patients, over sixty years of age, who attended regular medical appointments, were included consecutively; 33 patients with moderate or severe cognitive impairment were excluded, and eight patients refused to participate in the study, they stated that they did not have enough time to answer the survey questionnaire.

Anthropometry

Body measurements: weight, height, skinfolds, and circumferences [mid-upper arm, waist, hip, calf, and mid-arm muscle circumference (MAMC)] were performed, according to standardized and recommended procedures and techniques.¹⁸ A scale with integrated stadiometer (Soehnle model 7731), fiberglass tape (SECA), skinfold caliper (Lange, Cambridge Scientific Industries, Inc.) were used to obtain the anthropometric data from the participants. Two standardized nutritionists performed the measurements.

Handgrip strength

Dynamometry was taken in triplicate with a mechanical dynamometer (*Takei Ltd., Tokyo, Japan*). The measurement was taken from the dominant hand and performed with the arm extended while the patient was standing. The average value of the two highest readings was calculated.

Sarcopenia

To identify the presence of sarcopenia the equation developed by Baumgartner et al.,⁹ was applied. The appendicular skeletal muscle mass equation, [(ASM (kg) = 0.2487(weight) + 0.0483 (height) - 0.1584 (hip circumference) + 0.0732 (dynamometry) + 2.5843 (Sex) + 5.8828)] was calculated; subsequently, the ASM values were divided by height (m²) to obtain the skeletal muscle mass index (SMI). Based on Baumgartner criteria, the SMI cut-off point to define sarcopenia was < 5.45 kg/m², for females.

Nutritional assessment

The nutritional status was assessed using the mini nutritional assessment (MNA) instrument.¹⁹

Physical mobility

To evaluate mobility, the study guide recommended by Euronut-SENECA was used. This instrument included the following actives: crossing a room, rising from a chair, getting into and out of bed, lying down, climbing stairs, lifting or carrying a weight over 3.0 kg and kneeling or crouching.²⁰ Each one of these items had two possible answers according to the degree of difficulty that the participant had: 1) Can do it and 2). Cannot do it. In reference to the total mobility scores, the values obtained for each question were added and the patients were classified into two categories: 1) Good/intermediate physical performance (score 0-14) and 2) Physical disability (score 15-28).²¹

Activities of daily living

Katz's scale²² was used to assess basic activities of daily living (ADL) in order to identify the degree of dependency (elders with total independence, intermediate independence and dependence). For this purpose, patients were asked whether or not they could perform the following activities: bathing, dressing, using the bathroom, transferring (moves in and out of chair/bed), feeding and continence (control of sphincters bladder and bowel). The value 0 was assigned to the response: "I cannot do it" (dependent) and 1 to the response: "I can do it" (independent). In this scale, the maximum value of 6 indicated total independence; the values 1 to 5 indicated intermediate independence, and 0 very dependent.

Ethics

The objectives and procedures of the study were clearly explained to the elderly women, and each one signed an informed consent form. When another person accompanied the patient, the study protocol was also explained to them. The ethics committee of the Division of Biological Sciences and Health of the Autonomous Metropolitan University approved this study.

Statistical analysis

Analysis of variance (ANOVA) was performed to assess the association between anthropometric variables, nutritional status and sarcopenia. Test χ^2 and Fisher exact test, when appropriate, were used to

Table I
Distribution of socio-demographic characteristics, mobility and activities of daily living score in elderly Mexican women

	n = 90	(%)
<i>Education level</i>		
Illiterate	8	(8.8)
Elementary school	44	(48.8)
High school	13	(14.4)
Bachelor degree	18	(20.0)
College	7	(7.7)
<i>Marital Status</i>		
Widow	56	(62.2)
Married	18	(20.0)
Single	8	(8.8)
Divorced	8	(8.8)
<i>Lives with</i>		
Family	76	(84.4)
Alone	14	(15.5)
<i>Morbidity</i>		
Hypertension	54	(60.0)
Diabetes Mellitus	26	(28.8)
Mild cognitive impairment	10	(11.1)
<i>Smoking</i>		
Smoked in the past	29	(32.2)
Currently smoker	6	(6.6)
Non-smoker	55	(61.1)
<i>ADL (Katz's Scale)</i>		
Total Independence/	63	(70.0)
Moderate independence &	27	(30.0)
Dependence		
<i>Mobility (SENECA inst)</i>		
Good / intermediate	30	(33.0)
Physical performance		
Physical disability	60	(67.0)

compare the activities of SENECA and ADL instruments and sarcopenia. The association between MNA and sarcopenia was studied using χ^2 test. The results of the physical mobility score were dichotomized as follow: 1. Good and intermediate performance and 2. Physical disability. Also, the results of the Katz scale (ADL) were dichotomized into two categories: 1. Elders with total independence and 2. Elders with intermediate independence and dependence. Logistic regression models were constructed for each indicator of physical mobility and ADL, as dependent variables, and SMI as independent variable, controlled by age. In addition, a lineal regression model for total SENECA score was constructed as a dependent variable and SMI as independent variable, controlled for age. Furthermore, using the ADL total score as a dependent variable a similar analysis was carried out. P values ≤ 0.05 were considered statistically significant. The data analysis was performed using the statistical package JMP V. 8 (Statistical Discovery. TM Cary NC: SAS Institute Inc.).

Table II
Mean values of anthropometric measurements according to the presence of sarcopenia and the nutritional status in elderly Mexican women

Measure	Sarcopenia	Not sarcopenia	Undernutrition	Risk of undernutrition	Normal nutrition
	n = 37 \bar{X} (SD)	n = 53 \bar{X} (SD)	n = 14 \bar{X} (SD)	n = 65 \bar{X} (SD)	n = 11 \bar{X} (SD)
Weight (kg)	47.5 (7.1)	61.2 (8.8)**	46.1 (10.0)	56.0 (10.0)	60.1 (7.8)**
Height (cm)	148.5 (6.5)	149.5 (5.9)	146.4 (6.1)	148.7 (6.2)	153.3 (5.0)**
Body mass index (kg/m ²)	21.5 (2.8)	27.3 (3.3)**	21.6 (5.5)	25.3 (4.0)	25.5 (2.8)**
Mid-upper arm circumference (cm)	24.0 (3.3)	29.1 (3.1)**	23.0 (3.4)	27.4 (3.9)	28.2 (2.5)**
Mid- arm muscle circumference (cm)	19.6 (2.1)	22.5 (2.0)**	19.1 (2.2)	21.6 (2.4)	21.8 (1.4)**
Calf circumference (cm)	28.0 (3.7)	33.6 (3.3)**	28.2 (4.2)	31.3 (4.3)	34.5 (3.7)**
Tricipital skinfold (mm)	13.8 (5.5)	20.9 (5.8)**	12.2 (5.8)	18.5 (6.5)	20.4 (5.2)**
Bicipital skinfold (mm)	7.9 (3.8)	13.9 (5.9)**	7.4 (5.5)	11.6 (5.9)	13.6 (5.5)**
Subscapular skinfold (mm)	11.7 (5.0)	18.7 (5.7)**	10.0 (6.2)	16.4 (6.4)	17.5 (4.7)**
Suprailiac skinfold (mm)	13.0 (6.5)	18.9 (6.6)**	11.4 (9.8)	17.1 (6.8)	17.2 (7.0)**
Calf skinfold (mm)	12.4 (5.4)	20.2 (6.8)**	12.2 (5.9)	17.0 (7.1)	19.7 (8.0)**
Waist circumference (cm)	82.9 (10.6)	93.8 (9.9)**	79.9 (20.2)	89.8 (10.9)	90.0 (8.7)**
Hip circumference (cm)	93.2 (8.2)	102.4 (10.1)**	92.1 (12.2)	99.2 (10.0)	99.4 (8.6)**

\bar{X} (SD) Mean and standard deviation. **p < 0.01; *p < 0.05.

Results

Sarcopenia, undernutrition and anthropometric measurements

A total of 90 women were evaluated, their mean age was 78.2 (\pm 6.8). Table I presents the socio-demographic characteristics and the results of the ADL and mobility scores of the participants. The mean ASM and SMI were 12.2 (\pm 1.6) kg, and 5.4 (\pm 0.5) kg/m², respectively. The prevalence of sarcopenia was 41.1%. Higher muscle strength was identified in the women without sarcopenia (16.3 \pm 0.5 kg) compared to those with this condition (12.1 \pm 0.6 kg), (p < 0.001). The results of anthropometric characteristics by sarcopenia and nutritional status are shown in table II. Regarding the anthropometric variables, there were statistical differences in all of the measurements as related to sarcopenia (p < 0.01), except for height (p > 0.05). Particularly, calf circumference and MUAC were lower in women with sarcopenia and undernutrition, comparing with those elderly women without these conditions.

The MNA scores showed that only 11 (12.2%) participants had a normal nutritional status, 65 (72.2%) were in risk of undernutrition and 14 (15.5%) were undernourished. Figure 1 depicts the distribution of the nutritional status by the presence of sarcopenia. A significant association between nutritional status and sarcopenia was found, the OR between undernutrition and sarcopenia was high (OR = 47.3), controlled for aged; in the group of elderly woman with undernutri-

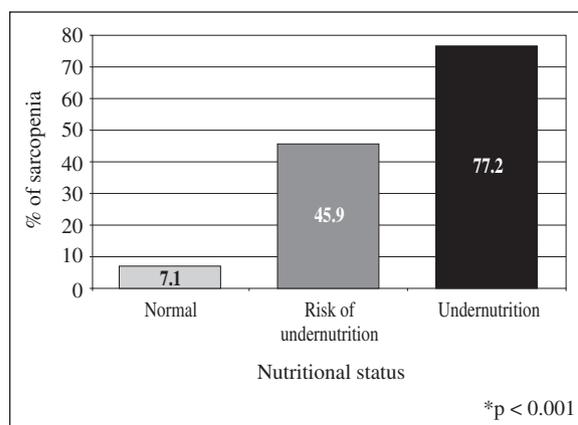


Fig. 1.—Prevalence of sarcopenia according to nutritional status.

tion 77.2% showed sarcopenia, and only 7.1% with normal nutritional status had sarcopenia (p < 0.001).

Sarcopenia and mobility

The results of the SENECA instrument showed that 30 (33.0%) of the elderly women studied were in a good/ intermediate performance category and 60 (67.0%) in the category of disability performance mobility by sarcopenic status. Climbing stairs was associated with sarcopenia (OR = 2.63, p = 0.03), controlled for age. No association was detected with other aspects of mobility as evaluated in the women studied, controlled by age (data not shown). However,

Table III
Physical mobility and activities of daily living according to the presence of sarcopenia

<i>Physical mobility (SENECA)</i>	<i>Sarcopenia</i>		<i>Without sarcopenia</i>		<i>p*</i>
	<i>n</i>	<i>(%)</i>	<i>n</i>	<i>(%)</i>	
<i>Crossing a room</i>					
Can do it	32	(86.5)	53	(100.0)	0.009
Can not do it	5	(13.5)	0	(0.0)	
<i>Rise from a chair</i>					
Can do it	28	(75.7)	50	(94.3)	0.010
Can not do it	9	(24.3)	3	(5.7)	
<i>Get into and out of bed</i>					
Can do it	31	(83.8)	53	(100.0)	0.004
Can not do it	6	(16.2)	0	(0.0)	
<i>Lying down</i>					
Can do it	31	(42.0)	53	(100.0)	0.004
Can not do it	6	(16.2)	0	(0.0)	
<i>Climbing stairs</i>					
Can do it	17	(46.0)	39	(73.6)	0.008
Can not do it	20	(54.0)	14	(26.4)	
<i>To lift or carry a weight over 3 kg</i>					
Can do it	9	(24.3)	19	(35.8)	0.360
Can not do it	28	(75.7)	34	(64.2)	
<i>Kneel or crouch</i>					
Can do it	8	(21.6)	19	(35.9)	0.147
Can not do it	29	(78.4)	34	(64.1)	
Good and intermediate physical performance	9	(24.3)	21	(39.6)	0.126
Physical disability	28	(75.7)	32	(60.4)	
<i>Basic activities of daily living (Katz scale)</i>					
	<i>n</i>	<i>(%)</i>	<i>n</i>	<i>(%)</i>	<i>p</i>
<i>Bathing</i>					
Independent	29	(78.4)	51	(96.2)	0.014
Dependent	8	(21.6)	2	(3.8)	
<i>Dressing</i>					
Independent	31	(83.8)	51	(96.2)	0.060
Dependent	6	(16.2)	2	(3.8)	
<i>Toileting (goes and uses the toilet)</i>					
Independent	33	(89.2)	50	(94.3)	0.440
Dependent	4	(10.8)	3	(5.7)	
<i>Transferring from a chair/bed</i>					
Independent	28	(75.7)	50	(94.3)	0.024
Dependent	9	(24.3)	3	(5.7)	
<i>Continence (control of sphincters bladder/bowel)</i>					
Independent	36	(97.3)	49	(92.4)	0.645
Dependent	1	(2.7)	4	(7.6)	
<i>Feeding</i>					
Independent	34	(91.9)	53	(100.0)	0.066
Dependent	3	(8.1)	0	(0.0)	
<i>Katz index score</i>					
Independent	13	(35.1)	50	(94.3)	0.001
Dependent	24	(64.9)	3	(5.7)	

χ^2 * Pearson's chi-square, or Fisher exact test.

considering the total SENECA score, a significant association was found with sarcopenia (mean score was 16.3 for women without sarcopenia and 18.3 for women with sarcopenia, ($p = 0.04$). In addition, the linear regression model coefficient showed that for each unit increase in the SMI, a decrease of -2.35 in the total score SENECA was found ($p < 0.02$), controlled for age.

Sarcopenia and basic activities of daily living

Based on the Katz's scale, 63 (70.0%) of the elderly women were independent and 27 (30.0%) showed intermediate independence/total dependence (table I). Table III shows the distribution of patients with and without sarcopenia by each activity of daily living in the Katz's score. The logistic regression model results for each single activity, showed no significant association with respect to sarcopenia, as controlled for age (data not shown). However, considering the total ADL score, an association with sarcopenia was found, 64.9% of the patients with intermediate independence/dependence had sarcopenia, while 35.1% of patients with independence had this condition [OR = 3.31, (95%CI (1.26, 8.71)), $p < 0.013$]. Also, the linear regression model coefficient showed that for one unit increase in the SMI a decrease of -0.42 in the Katz total score was found ($p < 0.01$), controlled for age.

Discussion

In the Mexican elderly women studied the prevalence of sarcopenia was 41%. In a previous report²³ of Mexico City community-dwelling elderly women, the prevalence of sarcopenia was 48.5%, and the criteria to assess sarcopenia was the European Working Group on sarcopenia in older people (EWGSOP)⁷. The difference in criteria applied to diagnose sarcopenia may contribute to the difference detected in the prevalence. The prevalence found in these studies is higher than the result found by Baumgartner in a group of Hispanic women in New Mexico, USA (prevalence of 35.3%).⁹ In addition, the Baumgartner's equation used herein has been applied in previous investigations and the prevalence reported has ranged from 10% to 52%.^{24,25,26} The prevalence of sarcopenia varies widely, depending on the population studied, definition and methods applied (technique used to measure skeletal mass, cut-off point for muscle mass, etc.) in an attempt to diagnose this condition.^{27,28} More studies are required to identify the diagnostic criteria of sarcopenia, that allows the best correlation with the clinical findings and also with the patient's functional capability.

About 15% of the participants in the present study showed undernutrition, according with the MNA results. This prevalence was higher than that which was identified in patients that were admitted to a private

hospital in Mexico City; where 7% showed undernutrition.¹⁶ This difference may be attributed to the lower socioeconomic status of the patients that were included in the present study, who were selected from the outpatient clinic at a government hospital in Mexico City. In other countries, such as Spain the prevalence of undernutrition in elderly people reported, varied widely from 8% to 31% (assessed by the MNA).^{29,30} The MNA is a well recognized tool to assess nutritional status.³¹ There is an important difference in the prevalence of undernutrition in the various elderly groups and it is difficult to compare the results due to the various definitions and methods used to assess this condition. Undernutrition in the elderly is a common and important clinical entity that should be diagnosed early on.³² The elderly women that showed undernutrition had a high prevalence of sarcopenia. Consistent with this information, a Turkish study of institutionalized male residents, also reported that sarcopenia was associated with low nutritional status.¹⁷

Our results indicated an association between anthropometric characteristics and sarcopenia. Older women identified with sarcopenia had lower anthropometric values, particularly in calf circumference (CC) average was below the recommended value (31 cm).³³ Accordingly, French studies have shown that elderly women identified with sarcopenia had lower anthropometric values, calf circumference has correlated with appendicular skeletal muscle mass ($r = 0.63$).²⁶ Also, French elderly women who showed a low calf circumference, presented greater movement difficulties than women with normal CC.³⁴ In the present study low MAMC measurements were associated with poor nutritional status and sarcopenia. Similarly, Landi et al.,³⁵ who studied Italian elders, observed that the highest MAMC values were found among older adults that showed good performance of ADL. In addition, an association has been identified between MAMC and functionality and MAMC has been related with the risk of falls in elderly people.⁴ Also, in a study carried out in institutionalized Japanese elders, calf circumference was lower in bedridden persons as compared with the independent elderly.³⁶

Sarcopenia and mobility

More than half of the women evaluated in this study had physical disabilities. Sarcopenia was associated with the inability to climb stairs. Elderly women with sarcopenia were about two times as likely to have difficulties in climbing of stairs, as compared to those without sarcopenia. Similarly, the results of the Framingham study indicated that elderly women with sarcopenia had a greater risk of inability to climb stairs, and also had a greater limitation in their mobility than did the non-sarcopenic women.³⁷ In addition, the regression model showed that lower ASM/m² scores were associated with higher difficulties in physical

mobility. Accordingly, Reid et al.³⁸ concluded that the decrease in skeletal muscle mass, in lower extremities, was associated with lower physical performance.

Sarcopenia and basic activities of daily living

The results of the Katz scale showed that more than half of the patients with intermediate independence and dependence had sarcopenia. In addition, the regression model showed that lower SMI were associated with higher disability scores. Consistent with these findings, a significant association was identified between ability to perform instrumental activities of daily living and fat free mass in institutionalized Turkish elderly; however, the authors did observe a negative relationship between sarcopenia and ADL; similarly, in the present some study individual ADL did not show a significant association with sarcopenia.¹⁷

Further studies are needed to understand the impact of sarcopenia in undernutrition, mobility and basic activities of daily living.

Limitations of the study

Among the limitations of this study, are those related to its cross-sectional design that does not allow identifying causal relationships. Another limitation could be related to the method that was selected to define sarcopenia (Baumgarner's equation) because it has not been validated in Mexican elders. However, applying this definition it was possible to observe an association between this condition and nutritional status, physical mobility and daily living activities among the elderly women studied.

Conclusions

The group of elderly women with sarcopenia had a higher prevalence of undernutrition, than did the group without sarcopenia. Calf and mid-arm muscle circumferences showed a significant association with sarcopenia. Older women with sarcopenia had more difficulties in physical mobility, particularly climbing stairs. Sarcopenia was also associated with the disability to perform daily living activities. Early diagnosis of both sarcopenia and undernutrition are important in the integral evaluation of the geriatric patient.

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