Risk factors associated with sarcopenia in elderly persons in military Hospital Central de la Defensa «Gómez Ulla»

Ajejas-Bazán MJ[1,2], Gómez-Crespo JM[1], Pérez-Pastor JM[1], Fuentes-Mora C[3]

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RESUMEN

Antecedentes y objetivos. La sarcopenia es un síndrome caracterizado por la disminución progresiva y generalizada de la masa muscular esquelética, la fuerza y la disminución del rendimiento físico. Los factores asociados son la edad, la dieta, el sedentarismo y las enfermedades crónicas. Se han realizado muy pocos estudios sobre la epidemiología de la sarcopenia en ancianos hospitalizados. El objetivo del estudio fue describir la prevalencia de sarcopenia e identificar los factores asociados entre pacientes ancianos hospitalizados en Madrid, España. **Material y Métodos**. Se realizó un estudio transversal en el Hospital Central de la Defensa «Gómez Ulla» durante el periodo de marzo a septiembre de 2018. Participaron 295 pacientes con edades mayores o iguales a 65 años. La sarcopenia se definió según el criterio EWGSOP2 que mide la masa muscular, la fuerza muscular y la funcionalidad. **Resultados**. La prevalencia de sarcopenia fue del 28,5 % (IC 95 % 23,3-33,7), sin diferencias significativas entre hombres y mujeres. El índice de masa corporal, estancia hospitalaria, consumo de alcohol, tabaquismo, actividad física, frecuencia de actividad física y fuerza de masa muscular, fuerza muscular y funcionalidad presentaron asociación con sarcopenia. **Conclusiones**. La prevalencia fue superior a otros estudios. El índice de masa corporal fue significativamente mayor en sujetos con sarcopenia. Se encontró una mayor proporción de fumadores en sujetos sin sarcopenia. Asimismo, se encontró asociación entre el ejercicio físico y una menor prevalencia de sarcopenia.

PALABRAS CLAVE: sarcopenia, prevalencia, factores epidemiológicos, fragilidad, estilo de vida saludable.

SUMMARY

Antecedents and objectives. Sarcopenia is a syndrome characterized by the progressive and generalized decrease in skeletal muscle mass, strength and decreased physical performance. Associated factors are age, diet, sedentary lifestyle and chronic diseases. Very few studies have been conducted on the epidemiology of sarcopenia in hospitalized elderly. The objective of the study was to describe the prevalence of sarcopenia and identify the associated factors among elderly patients hospitalized in Madrid, Spain. **Material y Methods**. A cross-sectional study was conducted at the Hospital Central de la Defensa "Gómez Ulla" during the period from March to September 2018. 295 patients with ages greater than or equal to 65 participated. Sarcopenia was defined according to the EWGSOP2 criterion measuring muscle mass, muscle strength and functionality. **Results.** The prevalence of sarcopenia was 28.5% (95% CI 23.3-33.7), without significant differences between men and women. The Body Mass Index, hospital stay, alcohol consumption, smoke, physical activity, frequency of physical activity and strength of muscle mass, muscle strenght and funcionality presented an association with the sarcopenia. **Conclusions.** The prevalence was higher than other studies. The body mass index was significantly higher in subjects with sarcopenia. A higher proportion of smoking was found in subjects without sarcopenia. Likewise, an association was found between physical exercise and a lower prevalence of sarcopenia.

KEYWORDS: Sarcopenia, Prevalence, Epidemiologic Factors, Frailty, Healthy Lifestyle.

INTRODUCTION

Sarcopenia is a syndrome characterized by the progressive and widespread skeletal muscle mass loss, strength and physical performance decreased[1] as well as increased risk of physical disability, poor quality of life and even death[2].

The prevalence varies according to geographical area and age groups but in general, the disease affects from the 1 to the 29 %[1] of the population and is associated with high mortality[3].

Furthermore, the factors associated with sarcopenia are age, diet, sedentary lifestyle and chronic disease[3]. Comorbidity and polypharmacy are two concepts closely related to aging, and although they are not primary causes of sarcopenia they can act as enhancers. For example, chronic obstructive disease and heart failure are two pathologies with a high prevalence in geriatric patients that are associated with alterations in muscle tissue, due to direct inflammatory effects, malnutrition, decreased muscle capillarity, alterations in capillary O2 supply or alterations in mitochondrial function. Therefore, a correct approach to its diagnosis and treatment can help to prevent its effect on sarcopenia[4].

[1] Nursing Department. Military School of Health. Central Defense Academy. majejas@ucm.es
[2] Nursing Department. Nursing, Physiotherapy and Podiatry Faculty. Complutense University, Madrid. Spain.
[3] Coordinator of Teaching Activities (Continuing Education) at HCD «Gómez Ulla»
Corresponding author. *María Julia Ajejas Bazán* . Academia Central de la Defensa. Escuela Militar de Sanidad. Calle Camino de Ingenieros 6
28047 Madrid (Spain)

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Likewise, many drugs used in elderly patients have side effects at the muscular level, such as atrophy, mitochondrial alterations or direct toxicity. Special attention should be paid to the use of glucocorticoids, beta-blockers, hydroxy-methyl-glutaryl-CoA reductase inhibitors or non-steroidal anti-inflammatory drugs.

Among the factors influencing the development of sarcopenia we can highlight the genetic influence which seems to be one of the most important contributors to individual variability in both muscle mass and muscle function and thus contributes to the development of sarcopenia. Some diseases prevalent in the elderly (cancer, chronic obstructive pulmonary disease or heart failure) are associated with an increase in serum cytokine levels, which may explain the loss of muscle mass. The aging process itself is associated with a chronic increase in proinflammatory cytokines. These biochemical alterations influence the overall muscle balance, favoring the development of sarcopenia. Due to the association between aging and decreased physical activity, often conditioned by various types of comorbidity, the level of physical activity plays a role in the development as well as in the prevention of sarcopenia. Thus, physical exercise has a protective effect against the development of sarcopenia. Between the second and the eighth decade of life, total energy intake decreases and, in parallel, so does protein intake. Thus, there is a loss of muscle mass due to negative catabolism.

The identification of this syndrome is complicated for various reasons, such as the existence of different criteria for its diagnosis and the lack of consensus on which variables should be taken into account and where the cut-off points should be. In the European context, the set of criteria published by the European Working Group on Sarcopenia in European Working Group on Sarcopenia in Older People (EWGSOP)[5] are the reference for diagnosis. They were updated in September 2018 and were renamed EWGSOP2[6]. These new criteria included the SARCF questionnaire as a means of to detect probable cases of sarcopenia. Another novelty on EWGSOP was to measure MS first, then MM and finally PP, as needed. The classification results were also modified to: probable sarcopenia, confirmed sarcopenia and severe sarcopenia. In addition, the cut-off points for the of the variables involved were reset.

Institutionalized elderly are the only ones mostly included in sarcopenia studies, and few studies have been done regarding the disease epidemiology among hospitalized elderly. Hospitalization has negative consequences in the elderly people such as cognitive impairment, physical disability, prolonged hospitalization, social isolation and decreased quality of life[7]. However, early sarcopenia identification is essential, particularly in the hospital setting, considering that some associated factors are present. There are currently few studies in Spain that analyze the risk factors that influence the development of sarcopenia in the elderly population and in hospitalized patients for acute processes.

The aim of the present study was to describe the prevalence of sarcopenia and identify factors associated among elderly patients hospitalized in Madrid, Spain.

Methods

A cross-sectional study was carried out at the Hospital Central de la Defensa "Gómez Ulla" during the period from 1st March to 30 September 2018. 295 consecutive patients with aged ≥ 65, which had signed the informed consent, were enrolled in the present study in this period. Not only patients diagnosed with dementia or cognitive disorders, but also people without mobility (bedridden), blind or with significant visual impairment and elderly people with edemas in lower limbs and / or amputation, were excluded.

The sample size was determined with a 95 % confidence level, the expected prevalence of sarcopenia, based on other studies, of 25 %[8], maximum error of 7 % was assumed. This way, a group of 147 people was obtained, the analysis was carried out with a gender perspective and as a result, 148 women and 147 men were selected. The total sample was 295 people[9]. The following variables were the ones studied: sex, date of birth, weight (kg, measured without shoes using a precision digital scale ± 100 g), height (m, measured without shoes using a portable size meter SIBER HEGNER MASCHINEN SH-101), Body Mass Index (BMI), level of studies, take any medication, admission diagnosis disease (acute / chronic), smoke, do you drink alcohol?, do you perform any type of physical activity?, weekly frequency of physical activity (to evaluate it, the criteria of the American College of Sports Medicine were considered)[10-14]. Regarding the sarcopenia dependent variable, it was defined according to the EWGSOP2. Of the different criteria for the diagnosis of sarcopenia, it was decided to use EWGSOP 2 for this study, as it is the one currently recommended by the Group for the European Working Group on Sarcopenia in Older People. The EWGSOP 2 criterion was calculated by measuring muscle mass (MM), muscle strength (MS) and function (PP)[1]. The MM was evaluated by measuring the calf circumference (CP), considered to be reduced when CP <31 cm[1,15]. The measurement protocol of the consulted literature was followed[16]. The MS was obtained from the palmar clamping force (FPP), evaluated using the Takei Hand Grip Dynamometer 5401, in accordance with the technique recommended by the American Society of Hand Therapists for dynamometry[17]. The value <30 kg for men and <20 kg for women[17] was used as the cut-off point[17]. The PP was measured through the march speed test, was carried out according to the methodology of the International Academy of Nutrition and Aging (IANA), in a 4-meter course on a flat surface with its usual step[18]. To determine the levels of sarcopenia using the EWGSOP2 criterion, firstly, a positive result in the SARCF questionnaire and a low MS were assessed and classified as "probable sarcopenia"; if they also had a low MM, it was classified as "confirmed sarcopenia"; and if they also had a low PP, it was called "severe sarcopenia". The SARC-F rapid diagnostic questionnaire analyzed five aspects: strength, need for assistance in walking, ability to get up from a chair, ability to climb stairs and falls. To do this, it asked about the difficulty each individual had in carrying out some activities.

The range of scores on the SARC-F scale is from 0 (no difficulties) to 10 (difficulties exist). Each aspect is scored from 0 to 2 (0=no difficulty, 1=some difficulty, and 2=a lot of difficulty/ disability). It was considered that an overall questionnaire score greater than or equal to 4 was considered to indicate the presence of sarcoidosis. 4 was considered to indicate the presence of sarcopenia[1].

A data collection notebook (CRD) was developed, where to participate in the study and to accept being informed was the first item included. The rest were the variables to be measured, previously described. Two of the experienced researchers performed the data collection and the corresponding measurements. Before data collection, informed consent and information letter about the project was provided. The CRD was developed by computer support to facilitate the collection, review and quality control of the data.

Statistical analysis

The sample was described based on the selected variables. The normality of the variables was measured with the Kolmogorov-Smirnov test; as they presented usual distribution, quantitative variables were described by means of arithmetic mean and standard deviation while qualitative variables by frequency distribution. The prevalence of sarcopenia was calculated, stratifying by variables, with its 95% confidence interval (CI). To evaluate whether there is a statistically significant association ($p < 0.05$) of the dependent variable with each of the independent ones, a bivariate analysis was performed. In the case of independent qualitative variables, the Pearson's chi-square test was performed and in the case of quantitative independent variables, the Student's t-test was used. Adjusted Odds Ratios of the main factors studied and their corresponding 95% confidence intervals were obtained. The independent variables included in each of the models were those with which a significant association was found in the bivariate analysis, or those that without presenting that association were considered relevant for the adjustment. The complete statistic package SPSS 21.0 developed for Windows was the main tool for tabulating and analizing the data treatment.

Researchers didn't show any kind of interests conflicts.

The study was evaluated by the Research Ethics Committee with HCD medications. The study was carried out in accordance with the basic principles of the Declaration of Helsinki (2013), the rules of Good Clinical Practice and the current Spanish legal regulations (Royal Decree 223/2004).

Participants were asked for informed consent verbally and in writing where the way to inform them at the time of its capture that the data collected, subsequent monitoring and results were the subject of the research study, in accordance with the Basic Law of Patient Autonomy (41/2002, especially in its Art 8.4). All data was treated with the maximum guarantees of confidentiality in accordance with its current legislation. (Law 15/1999). Informed consent signed in duplicate was collected, being one copy for the project researchers and the other copy for the participant. In this way, the participant will have the data of the researchers to answer questions and revoke the consent, if desired.

Results

We included 295 participants with a mean age of 76.5 ± 8.5 years (65-91 years); 147 were men y 148 women (49.8 % y 50.2 %, respectively).

The characteristics of the study population according to sex are presented in table 1. The men had significantly higher education level than women (higher studies men 15.0 % vs. 7.4 % women) and men took more medication than women (93.9 %, 87.8 %). Alcohol and tobacco consumption, were significantly lower in women than men. Doing sports and the frequency of doing sports were, essentially lower, in men (table 1).

Table 1. *Sample characteristics*

		Total n (%)	Male n (%)	Female n (%)	p-value
Education level	Illiterate	31 (10.5)	12 (8.2)	19 (12.8)	0.031
	Level 1/2 education	97 (32.9)	48 (32.7)	49 (33.1)	
	A-level education	46 (15.6)	16 (10.9)	30 (20.3)	
	Professional studies (FP) and Baccalaureate	88 (29.8)	49 (33.3)	39 (26.4)	
	Higher Education	33 (11.2)	22 (15)	11 (7.4)	
Take medication	Yes	268 (90.8)	138 (93.9)	130 (87.8)	0.072
	No	27 (9.2)	9 (6.1)	18 (12.2)	
Kind of disease	Acute	262 (88.8)	132 (89.8)	130 (87.8)	0.594
	Chronic	33 (11.2)	15 (10.2)	18 (12.2)	
Smoke	Yes	36 (12.2)	28 (19.0)	8 (5.4)	0.000
	No	259 (87.8)	119 (81.0)	140 (94.6)	
Take alcohol	Yes	43 (14.6)	34 (23.1)	9 (6.1)	0.000
	No	252 (85.4)	113 (76.9)	139 (93.9)	
Physical Activity	Yes	270 (91.5)	132 (89.8)	138 (93.2)	0.044
	No	25 (8.5)	15 (10.2)	10 (6.8)	
Physical activity frequency	Nothing	25 (8.5)	15 (10.2)	10 (6.8)	0.032
	Once	67 (22.7)	35 (23.8)	32 (21.6)	
	Twice	98 (33.2)	49 (33.3)	49 (33.1)	
	More three times	104 (35.3)	48 (32.7)	56 (37.8)	

Source: Own elaboration; $p<0.05$

The prevalence of sarcopenia was 28.5 % (IC 95 % 23.3-33.7), with no meaningful difference between men and women (29.9 (IC 95 % 24.7-35.1) vs. 27.0 (IC 95 % 21.9-32.1), p=0.58)). Table 2 details the clinical and demographic characteristics of participants, sarcopenic patients, and the comparation results between patients with and without sarcopenia patients. A univariate analysis compared sarcopenic identified BMI, stay at hospital, alcohol consumption, physical activity, frequency of physical activity and MM, MS and PP as sarcopenia associated variables.

Likewise, the multivariate analysis showed that BMI, stay at hospital, smoking, physical activity and physical activity frequency, MM, MS and PP were significantly associated with sarcopenia (table 3).

Table 2. *Risk factors associated sarcopenia*

VARIABLES		SARCOPENIA			NO SARCOPENIA			p-valor
		n (%)	95 % CI	Mean/SD	n (%)	95 % CI	Mean/ SD	
Sex	Men	44 (29.9)	(24.7-35.1)		103 (70.1)	(64.9-75.3)		0.58
	Women	40 (27.0)	(21.9-32.1)		108 (73.0)	(67.1-78.1)		
Age	65-70	27 (23.47)	(18.6-28.2)	76.92/8.6	88 (76.52)	(70.5-80.5)	75.3/8.4	1.51
	71-75	15 (37.5)	(32.0-43.0)		25 (62.5)	(55.7-69.3)		
	76-80	1 (12.5)	(7.8-17.2)		7 (87.5)	(82.8-92.2)		
	>80	41 (13.9)	(87.0-95.0)		91.0 (30.8)	(62.4-75.4)		
BMI				25.3/4.2			24.9/3.9	0.01
Studys level	Sin estudios	14 (45.2)	(38.2-52.2)		17 (54.8)	(47.8-61.8)		0.49
	E. Primaria	21 (21.6)	(15.8-27.4)		76 (78.4)	(72.6-84.2)		
	E. Secundaria	13 (28.3)	(22.0-34.6)		33 (71.7)	(65.4-78.0)		
	Bachillerato/FP,s	26 (29.5)	(23.1-35.9)		62 (70.5)	(64.1-76.9)		
	E. Superiores	10 (30.3)	(23.8-36.8)		23 (69.7)	(63.2-76.2)		
Stay at hospital				26.3/5.8			22.8/4.2	0.02
Toma medicación	Yes	76 (28.4)	(22.1-34.7)		192 (71.6)	(65.3-77.9)		0.88
	No	8 (29.6)	(23.2-36.0)		19 (70.4)	(64.0-76.8)		
Tipo de enfermedad	Acute illness	7 (21.2)	(15.4-27.0)		26 (78.8)	(73.0-84.6)		0.32
	Chronic disease	77 (29.4)	(23.0-35.8)		185 (70.6)	(64.2-77.0)		
Smoking	Yes	5 (13.9)	(9.0-18.8)		31 (86,1)	(81.2-91.0)		0.03
	No	79 (30.5)	(24.0-37.0)		180 (69.5)	(63.0-76.0)		
Alcohol consumption	Yes	12 (27.9)	(21.6-34.2)		31 (72.1)	65.8-78.4)		0.92
	No	72 (28.6)	(22.2-35.0)		180 (71.4)	(65.0-77.8)		
Physical activity	Yes	77 (28.5)	(22.1-34.9)		193 (71.5)	(65.1-77.9)		0.04
	No	18 (72.0)	(65.7-78.3)		7 (28.0)	(21.7-34-3)		
Frequency of physical activity,	Sedentary	18 (72.0)	(65.7-78.3)		7 (28.0)	(21.7-34-3)		0.02
	Little exercise	44 (26.7)	(20.5-32.9)		121 (73.3)	(67.1-79.5)		
	Get plenty of exercise	32 (30.8)	(24.3-37.3)		72 (69.2)	(62.7-75.7)		
Muscle Mass				29.8/3.4			29.3/3.5	0.28
Muscular Strength				14.1/3.3			18.2/7.7	0.00
Gait Speed				1.16/0.3			1.17/0.3	0.76

Source: Own elaboration

Table 3. *Multivariate analysis*

Factors	Odds Ratio *(95 % CI)*	p-value
BMI	0.82 (0.73-0.92)	0.008
Stay at hospital	1.05 (1.01-1.11)	0.017
Smoking	0.96 (0.85-1.09)	0.037
Physical activity	0.61 (0.38-0.97)	0.047
Frequency of physical activity	0.76 (0.66-0.88)	0.052
Muscular Strength (MS)	1.08 (1.02-1.15)	<0.001

Source: Own elaboration

Discussion

The present study stems from a previous study carried out with the same sample, in which we studied whether there were differences in the diagnosis of sarcopenia depending on the type of criteria used for diagnosis. In addition, more variables related to risk factors were collected, which have allowed this study to be carried out[19].

In the present study, the frequency of sarcopenia among the hospitalized elderly population was 28.5 %, and the results were higher than those of other studies conducted in acutely ill elderly people (11.2 %)[20]. A study in Brazil evaluated MM and reported a prevalence of 15.4 % in community-dwelling elderly, which was slightly lower than the results of the present study[21]. One study showed that the prevalence according to EWGSOP2 seems to

decrease compared to that of EWGSOP (2010)[22]. This is not our case, because hospitalization is often associated with comorbidities, which can trigger sarcopenia due to increased inflammatory response and physical inactivity[23]. This reason could explain the higher prevalence value even using the EWGSOP2 criteria. The explanation for the lower frequency in other studies was the different method used to determine MM and to diagnose sarcopenia, which may have underestimated its occurrence. It would be necessary to study the effect of acute comorbidity and change in physical activity pattern in hospitalized patients and its influence on sarcopenia[24].

In relation to risk factors, mean BMI is significantly higher in subjects with sarcopenia, with 72.3 % of all adults with sarcopenia being overweight. In this study, higher BMI values were found compared to the other studies in which the majority of participants were of normal weight (mean 25.3 % ± 4.2 vs. mean 21.5 % ± 2.4 vs. mean 20.5 % ± 1.9 vs. mean 19.9 % ± 3.0 vs.)[23, 25]. It is true that as age increases, fat tissue increases and MM decreases. In our study, MM is practically equal in adults with and without sarcopenia, with no significant findings. Perhaps the different method used to determine MM was the reason for similar results on MM. In relation to the days of hospital stay, the mean number of days was greater in those with sarcopenia, with a significant difference. Thus, an increase in hospital stay could imply an increase in BMI due to a change in diet and caloric intake and a decrease in physical activity of the admitted patients. Likewise, measurements were taken only once throughout the hospital process, and it would be advisable to follow up from the day of admission and take several measurements throughout the process to observe changes in MM, SM and PP. In addition, weight gain worsens the evolution of concomitant diseases presented by patients. It would be advisable to include all chronic diseases presented on admission.

In relation to the variables describing healthy lifestyles, a higher proportion of smokers was found in subjects without sarcopenia. This result is similar to that found in another study[26], but unlike other studies such as the one conducted in 2015[27], this discrepancy does not confirm whether it is a risk or protective factor. A statistically significant association was found between sport and a lower prevalence of sarcopenia (28.5 % of subjects who practiced sport had sarcopenia compared to 71.5 % of subjects who practiced sport and did not have sarcopenia), with those who performed medium physical activity having lower numbers of sarcopenia compared to those who did not do sport or did intense sport. This may be due to the fact that in this age group the type of exercise is not usually very intense, due to the morbidities they present and therefore being impossible to perform intense physical exercise, which contributed to a loss of MM and an increase in sarcopenia and to an increased risk of falls and fractures.

In order to be able to comprehensively analyze the results obtained, it would be desirable to carry out longitudinal studies that could establish the prevalence and incidence of sarcopenia with respect to the variables studied.

The study had some limitations, such as the cross-sectional nature of the study, which prevents a cause-effect connection in some relationships. The prevalence of sarcopenia may have been underestimated, because older people with more severe and acute conditions and those with inability to perform physical tests were excluded.

Conflicts of interest

None to declare.

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