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Prevalence of Sarcopenia and Its Association with Malnutrition in Hospitalized Elderly Patients

Hastanede Yatan Yaşlı Hastalarda Sarkopeni Prevalansı ve Malnütrisyon ile İlişkisi

Mevlüt Kaçar[1] | Mehmet Uzunlulu[2] | Erhan Eken[2] | Semih Başcı[3]

[1]Celal Bayar University, Faculty of Medicine, Department of Rheumotology, Manisa, Türkiye
[2]İstanbul Medeniyet University, Göztepe Prof. Dr. Süleyman Yalçın City Hospital, Department of Internal Medicine, İstanbul, Türkiye
[3]Dokuz Eylül University, Faculty of Medicine, Department of Hematology, İzmir, Türkiye

Sorumlu Yazar | Correspondence Author
Erhan Eken
erhan-eken@hotmail.com
Address for Correspondence: İstanbul Medeniyet University, Göztepe Prof. Dr. Süleyman Yalçın City Hospital, Department of Internal Medicine, İstanbul, Türkiye.

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Prevalence of Sarcopenia and Its Association with Malnutrition in Hospitalized Elderly Patients

ABSTRACT

Objective: To investigate the prevalence of sarcopenia and evaluate the nutritional status in geriatric patients hospitalized at the Internal Medicine Clinic.

Material and Method: A total of 105 patients (54 female and 51 male) aged ≥ 65 years (mean age: 74 ± 6 years) hospitalized between November 2015 and January 2016 were consecutively enrolled in this prospective and observational clinical study. Muscle mass was evaluated by bioelectrical impedance device, muscle function by walking test, and strength by hand grip test. Patients were diagnosed with sarcopenia, pre-sarcopenia, and non-sarcopenic. Mini nutritional assessment (MNA) test was used to define malnutrition.

Results: The number of patients diagnosed with sarcopenia and pre-sarcopenia was 49 (46.7%) and 5 (4.8%), respectively. The prevalence of sarcopenia was higher in female patients than male patients (61.1% vs. 31.4%; *p=0.006*). The prevalence of malnutrition in patients with sarcopenia and without sarcopenia were 51%, 10%, and the rate of patients at risk of malnutrition with sarcopenia and without sarcopenia was 37%, 49%, respectively. The prevalence of malnutrition was significantly higher in patients with sarcopenia (*p<0.001*). 40.8% of sarcopenic patients were overweight or obese. In the logistic regression analysis, female gender (OR=3.3, CI=1.35-8.04) and malnutrition (OR=9.41, CI=3.06-28.95) were significant risk factors for the development of sarcopenia.

Conclusion: Approximately half of the hospitalized geriatric patients were sarcopenic or pre-sarcopenic, and 88% of patients with sarcopenia had malnutrition or at risk of malnutrition. Sarcopenia and malnutrition should be evaluated together in geriatric inpatients and sarcopenic obesity should not be ignored.

Keywords: Bioelectrical Impedance Analysis, Malnutrition, Obesity, Sarcopenia.

ÖZET

Amaç: İç Hastalıkları Kliniğinde yatan geriatrik hastalarda sarkopeni prevalansını araştırmak ve beslenme durumunu değerlendirmek.

Gereç ve Yöntem: Hastanede yatan 65 yaş üstü toplam 105 hasta (54 kadın ve 51 erkek) (ortalama yaş: 74 ± 6 yıl) ardışık olarak çalışmaya dahil edildi. Kas kütlesi biyoelektrik empedans cihazı ile, kas fonksiyonu yürüme testi ile ve kas gücü el kavrama testi ile değerlendirildi. Hastalar sarkopeni, pre-sarkopeni ve sarkopenik olmayan olarak teşhis edildi. Malnütrisyonu tanımlamak için mini nütrisyonel değerlendirme (MNA) testi kullanılmıştır.

Bulgular: Sarkopeni ve pre-sarkopeni tanısı konan hasta sayısı sırasıyla 49 (%46,7) ve 5 (%4,8) idi. Sarkopeni prevalansı kadın hastalarda erkek hastalara göre daha yüksekti (%61,1' e karşı %31,4; *p=0,006*). Sarkopenisi olan hastalarda malnütrisyon prevalansı %51 ve malnütrisyon riski taşıyan hastaların oranı %37; sarkopenisi olmayan hastalarda malnütrisyon prevalansı %10 ve malnütrisyon riski taşıyan hastaların oranı %49 idi. Malnütrisyon prevalansı, sarkopenik olmayan katılımcılara kıyasla sarkopenili hastalarda anlamlı derecede yüksekti (*p<0,001*). Sarkopenik hastaların %40,8' i obez veya kiloluydu. Lojistik regresyon analizinde kadın cinsiyet (OR=3.3, CI=1.35-8.04) ve malnütrisyon (OR=9.41, CI=3.06-28.95) sarkopeni gelişimi için önemli risk faktörleriydi.

Sonuç: Hastanede yatan geriatrik hastaların yaklaşık yarısı sarkopenik veya pre-sarkopenikti ve sarkopenisi olan hastaların %88' inde malnütrisyon vardı veya malnütrisyon riski altındaydı. Yatan geriatrik hastalarda sarkopeni ve malnütrisyon birlikte değerlendirilmeli ve sarkopenik obezite göz ardı edilmemelidir.

Anahtar Sözcükler: Biyoelektrik Empedans Analizi, Malnütrisyon, Obezite, Sarkopeni.

Introduction

Sarcopenia is a syndrome of generalized and progressive loss of muscle mass and strength, resulting in reduced physical performance in geriatric patients (1). The increase in physical disability over time leads to a serious decline in patients' quality of life, poor clinical outcomes and increased mortality. Sarcopenia is associated with aging and can also be caused by immobility, malnutrition, and cachexia (2). It was reported that 1%–29% of individuals aged ≥50 years living in the community, 14%–33% under long-term care, and 10% of inpatients from the same age group were sarcopenic based on the sarcopenia definitions of the European Working Group on Sarcopenia in Older People (EWSGOP) and the International Working Group on Sarcopenia (IWGS) (3). Previous studies reported that sarcopenia had higher prevalence in hospitalized geriatric patients and was associated with physical frailty, functional dependence, decreased quality of life, falls, prolonged hospital stay, increased prevalence of readmission, and increased risk of mortality (4-7). Patients with low muscle mass but normal functioning muscles are defined as "pre-sarcopenia," and patients with low muscle function in terms of physical performance or muscle strength or both are defined as "sarcopenia" pursuant to the diagnostic criteria of EWSGOP (1). Malnutrition is defined as a nutritional condition resulting from a deficiency or excess (or imbalance) of energy, protein, and other nutrients, leading to measurable effects on tissue/body form (body shape, size, and composition), function, and clinical status (8). Malnutrition and sarcopenia are distinct conditions in older adults, sharing common underlying causes such as age-related physiological changes, insufficient protein and energy intake, and inflammation associated with acute or chronic diseases (8,9). Malnutrition is recognized as one of the important key pathophysiological causes of sarcopenia (10,11). The Mini Nutritional Assessment (MNA) has been developed to assess the nutritional status of the geriatric patient population and to provide early intervention for potential malnutrition (12,13).

The aim of this study was to investigate the prevalence of sarcopenia and to evaluate the nutritional status of geriatric patients hospitalized in the Internal Medicine Clinic.

Material and Method

This observational clinical study involved patients aged 65 years and older who were admitted to the Internal Medicine Clinic of Istanbul Medeniyet University Göztepe Training and Research Hospital, from November 2015 to January 2016. Local ethics committee approval was obtained before the commencement of the study, and the principles of the World Medical Association (WMA) Declaration of Helsinki-Ethical Principles for Medical Research Involving Human Participants were complied throughout the study. The study exclusion criteria were as follows: patients with anasarca-type edema, diagnosed malignancy, positive inotrope support, impaired cognitive function, or deformities preventing the participants from performing assessment tests.

Study design: Demographic characteristics and anthropometric measurements, including calf circumference, upper arm circumference, waist circumference, weight, height, and body mass index (BMI), were collected from eligible patients who consented to participate in the study. Additionally, the MNA test was conducted for nutritional evaluation. The prevalence of sarcopenia and pre-sarcopenia was assessed. The study examined the prevalence of malnutrition in patients both with and without sarcopenia.

Sarcopenia classification: The classification of sarcopenia was determined according to the diagnostic criteria suggested by EWGSOP: pre-sarcopenia (low muscle mass), sarcopenia (low muscle mass and either low muscle strength or low physical performance) (1).

Measurements: Muscle mass was evaluated using a bioelectrical impedance device, physical performance with walking test, and muscle strength with hand grip test (1).

Muscle mass measurement: Bioelectrical impedance analysis (BIA) was used to assess the body composition of the patients. The measurements were made by placing two electrodes on the proximal and distal

parts of the right hand and foot in the supine position while the patients were fasting, urine-free, and without any metal (necklace, ring, watch, etc.) attached to their bodies. Muscle mass of the patients was evaluated by measuring fat-free mass index (FFMI) with BIA. In the same population, patients below two standard deviations compared to younger adults aged 18–40 years were included in the group with lower muscle mass.

Muscle strength measurement: Hand grip test was performed using a Jamar Hand Dynamometer. Patients were seated in a chair with their elbows resting on the table and their arms bent at 90 degrees parallel to the floor. Three measurements, with 1 minute rest between repetitions, were then taken in both arms. The largest value was captured from three measurements. Accordingly, readings below 15 kg for men and 10 kg for *women were considered to indicate "low muscle strength."*

Physical performance assessment: Patients underwent the 6-minute walk test to assess their physical performance. During the test, the patients were asked to get out of bed and walk 6 meters. While the patients were walking, walking times were measured using a stopwatch and walking speeds were recorded in meters/second. Those walking less than 0.8m/s were considered to have poor physical performance.

Nutritional assessment: Firstly, the MNA test short form (MNA-SF) was administered to patients as a screening test. The long form of MNA was used in patients who scored ≤11 points on the MNA-SF test. Patients having a total MNA score of less than 17, between 17 and 23.5, and more than 23.5 were classified as malnourished, at risk of malnutrition, and normally nourished, respectively.

Statistical analysis

Analyses were performed using Statistical Package for the Social Sciences (SPSS) software version 27.0 (SPSS Inc, Chicago, IL). Variables were given as mean and standard deviation. The conformity of the variables to normal distribution was examined by Shapiro-Wilk *($p<0.05$)*. Student's t-test was used to compare independent groups for variables conforming to normal distribution. Mann-Whitney U test and Kruskal-Wallis test were preferred for variables that did not fit the normal distribution. Chi-square test or Fisher's exact test was preferred for the comparison of categorical variables. Multivariate analysis of the factors associated with sarcopenia was performed with logistic regression analysis. Continuous variables from independent variables are expressed as mean ± standard deviation. *$p<0.05$* was set as the limit of statistical significance. Analysis was performed with G-power application and 102 patients were considered sufficient for the sample size.

Results

A total of 105 participants, 54 women and 51 men, with a mean age of 74 ± 7 years, were included in the study. Demographic, anthropometric and nutritional data are shown in Table I. Muscle mass (6.6 ± 1.3 kg/m^2 vs. 8 ± 1.3 kg/m^2) and hand grip strength (12.6 ± 6 kg vs. 24.4 ± 10.2 kg) were lower in female participants compared to males (*$p<0.01$* for both). The distribution of sarcopenia, pre-sarcopenia and non-sarcopenia groups according to gender and age is given in Table II. In a total of 105 patients, the number of patients diagnosed with sarcopenia and pre-sarcopenia were 49 (46.7%) and 5 (4.8%), respectively. Of the 49 patients with sarcopenia, 33 (67.3%) were female and 16 (32.7%) were male; of the 5 patients with pre-sarcopenia, 2 (40%) were female and 3 (60%) were male. The prevalence of sarcopenia was significantly higher in female patients than in male patients (61.1% vs. 31.4%, *$p=0.006$*). Of the 56 patients under 75 years, 27 (48.2%) were sarcopenic, whereas 22 (44.9%) of the 49 patients aged 75 years and above were also sarcopenic, with no significant difference seen between the groups (*$p=0.87$*).

Demographic, anthropometric and nutritional status of patients according to sarcopenia groups are shown in Table III. Waist circumference, BMI, calf circumference, arm circumference, muscle mass, hand grip strength, MNA-SF and total MNA scores were significantly decreased in the sarcopenia group compared to the non-sarcopenia group (*$p<0.001$* for all). Looking at the total MNA scores

of sarcopenic patients in our study group, 51% had malnutrition and 37% were at risk of malnutrition. In contrast, 10% of patients without sarcopenia were malnourished and 49% were at risk of malnutrition. The prevalence of malnutrition was significantly increased in patients with sarcopenia compared to non-sarcopenic individuals (*p<0.001*).

Table I. Demographic, Anthropometric, and Nutritional Characteristics of the Patients

	All (n = 105)	Female (n = 54)	Male (n = 51)	*p-value*
Age (years)(mean±SD)	74 ± 7	73 ± 7	74 ± 6	*0.66*
Body mass index (kg/m²)	26.5 ± 6.1	25.6 ± 4.5	25.1 ± 7	*0.40*
Waist circumference (cm)	99.1 ± 17.9	98.8 ± 17.7	98.5 ± 18.6	*0.62*
Arm circumference (cm)	28.2 ± 5.0	27.7 ± 3.8	27.6 ± 5.2	*0.71*
Calf circumference (cm)	33.8 ± 5.2	33.8 ± 6.2	35 ± 6.9	*0.36*
Muscle mass (kg/m²)	7.2 ± 1.1	6.6 ± 1.3	8 ± 1.3	***<0.001***
Hand grip strength (kg)	18.3 ± 10.1	12.6 ± 6.0	24.4 ± 10.2	***<0.001***
Walking speed (s)(n)	0.72 ± 0.15 (16)	0.7 ± 0.15(10)	0.75 ± 0.17(6)	*0.42*
MNA-SF	10.0 ± 2.4	10.0 ± 2.6	10.3 ± 2.7	*0.11*
MNA total	19.0 ± 4.1	18.2 ± 3.7	19.0 ± 4.4	*0.12*

MNA: Mini nutritional assessment, SF: Short form, CI: Confidence İnterval

Logistic regression analysis was performed to evaluate the effect of gender, age and malnutrition independent variables on sarcopenia. Gender (OR=3.3, 95% CI [1.35-8.04], p=0.008) and malnutrition (OR=9.41, 95% CI [3.06-28.95], *p=0.001*) had a significant effect on the occurrence of sarcopenia; the age variable was not significant (OR=0.7, 95% CI [0.291-1.72], *p=0.450*). Female patients were 3.3 times more likely to develop sarcopenia than male patients. Patients with malnutrition were 9.41 times more likely to develop sarcopenia than those without malnutrition.

Table II. Distribution of Sarcopenia, Pre-sarcopenia, and Non-sarcopenic Groups by Sex and Age

	Sarcopenia (n=49)	Pre-sarcopenia (n=5)	Non-sarcopenia (n=51)	*p-value*
Female (n = 54)	33 (61.1)	2 (3.7)	19 (35.2)	***0.006***
Male (n = 51)	16 (31.4)	3 (5.9)	32 (62.7)	
>75 age	27 (48.2)	3 (5.4)	26(46.4)	*0.87*
≤75 age	22 (44.9)	2 (4.1)	25(51)	

When the patients were evaluated according to BMI measurements, 49% of sarcopenic patients had a normal BMI (18-25 kg/m²) compared to 25.5% of patients without sarcopenia, a significant difference (*p<0.001*). In addition, 40.8% of sarcopenic patients were overweight or obese.

Table III. Demographic, Anthropometric, and Nutritional Characteristics of Sarcopenia, Pre-Sarcopenia, and Non-Sarcopenic Groups

	Sarcopenia (n = 49)	Non-sarcopenia (n = 51)	*p-value*
Age (years) (Mean ± SD)	74±7	74±7	*0.93*
Waist circumference (cm)	92.18±16.7	106.8±16.6	***<0.001***
Body mass index (kg/m²)	24.9±6.6	28.5±5.1	***<0.001***
Calf circumference (cm)	32±5.3	35.9±4.6	***<0.001***
Arm circumference (cm)	26,16±5	30,4±4,2	***<0.001***
Muscle mass (kg/m²)	6.4±0.7	8.3±1.1	***<0.001***
Hand grip strength (kg)	11±4.9	24.7±9.28	***<0.001***
Walking speed (s)(n)	0.67±0.14 (11)	0.77±0.18 (3)	***0.456***
MNA-SF	8,14±2,46	10,44±1,94	***<0.001***
MNA total	17,46± 4,4	21,6±3.97	***<0.001***
Prevalence of malnutrition (n, %)	25 (51)	5 (10)	***0.001***
Prevalence of malnutrition risk (n, %)	18 (37)	25 (49)	
Prevalence of normal nutrition (n, %)	6 (12)	21 (41)	
BMI: <18 kg/m² (n,%)	5 (10.2)	-	***<0.001***
18≤ BMI <25 kg/m² (n,%)	24 (49)	13 (25.5)	
25≤ BMI <30 kg/m² (n,%)	10 (20.4)	10 (20.4)	
BMI: ≥30 kg/m² (n,%)	10 (20.4)	20 (39.2)	

MNA: Mini nutritional assessment, SF: Short form, BMI: Body mass index

Discussion

The present study found that almost half of the hospitalized geriatric patients were sarcopenic and 51% of them were malnourished. A total of 88% of patients with sarcopenia or pre-sarcopenia had malnutrition or were at risk of malnutrition. Furthermore, 40.8% of patients with sarcopenia were classified as overweight or obese based on BMI values.

Sarcopenia is a syndrome characterized by generalized and progressive loss of muscle mass, which can lead to adverse health outcomes, including physical disability, poor quality of life, and mortality (1). It has been suggested that the multifactorial causes of sarcopenia may include neurological disorders, hormonal changes, inflammatory pathway activation, activity limitations, chronic diseases, fatty infiltration, and malnutrition (14). Malnutrition,

among the foregoing factors, is considered one of the most important pathophysiologic factors both as a cause of sarcopenia and as a manifestation of comorbid sarcopenia (malnutrition–sarcopenia syndrome), particularly in the geriatric population (15). The results of the present study demonstrated that the rate of patients with sarcopenia constituted approximately half of the geriatric patients included in the study, with half of them having malnutrition, which was consistent with previous reports. On the other hand, the logistic regression analysis revealed that malnutrition increases the risk of developing sarcopenia by 9.4 times. This finding highlights the importance of nutritional assessment in individuals with sarcopenia.

Advanced age is considered an independent risk factor for both sarcopenia and malnutrition. Research investigating the connection between sarcopenia and age revealed that its prevalence in men was 14% for those younger than 70 years, 20% for those aged 70–74, 27% for individuals aged 75–80, and 53% for men older than 80 years. For women in the corresponding age groups, the rates were found to be 23%, 33%, 36%, and 43%, respectively. The findings demonstrated that sarcopenia was more common among women in all age groups except those above 80 years. Additionally, the prevalence of sarcopenia showed an upward trend with increasing age in both men and women (16). A multicenter research examined the risk of sarcopenia and its related variables in inpatients aged ≥65 years, revealing that 48.8% of patients were at risk of sarcopenia, with a greater incidence seen in female participants and older age groups. Furthermore, the duration of hospital stay, prevalence of malnutrition, and incidence of dysphagia were elevated in participants at risk of sarcopenia compared to those without sarcopenia; multivariate analysis indicated that age, female gender, and bedridden condition were independently correlated with the risk of sarcopenia (17). In our study, the logistic regression analysis showed that being female increased the risk of developing sarcopenia by 3.3 times, which appears to be consistent with the literature. The lack of association between the age variable and the risk of sarcopenia may be due to the high average age of the patients and the heterogeneity of the age distribution.

Earlier research has shown varying results concerning the prevalence of sarcopenia, likely due to differences in study methodologies, populations studied, and the diagnostic criteria employed. The imaging methods typically used to measure muscle mass are based on the muscle mass measurements of a younger healthy population. In studies with BIA and bone density scan (DEXA) measurements, participants with -2 standard deviation (SD) muscle mass compared to the younger population were considered sarcopenic. Nevertheless, certain studies classified participants with -1-2 SD muscle mass as sarcopenic. According to the Third National Health and Nutrition Examination Survey (NHANES III) data (1988–1994), in a comprehensive survey in a field on 4504 patients aged >60 years, participants with -1-2 SD were designated as Class 1 sarcopenia and patients with -2 SD as Class 2 sarcopenia upon BIA measurements. Using this classification, the prevalence of Class 1 sarcopenia was observed to be 59% among women and 45% among men. Meanwhile, Class 2 sarcopenia was present in 10% of female participants and 7% of male participants (18). A Japanese study by Tanimoto et al. on 1110 elderly people aged >65 years, who were reached through social assistance centers and local newspaper advertisements, the prevalence of sarcopenia was 14.9% in female and 13.3% in male participants, via BIA measurements (19). Similarly, in this study, it was observed that the prevalence of sarcopenia was high among geriatric patients, also the prevalence of malnutrition was higher in sarcopenic patients and most of these patients were female.

Although sarcopenia occurs in patients with both low and normal BMI, there is increasing evidence that sarcopenia also occurs in overweight and even obese individuals, and this condition has been termed as sarcopenic obesity in the literature. Sarcopenic obesity is a condition marked by the simultaneous presence of diminished skeletal muscle mass and function alongside an increase in body fat (20). With the global aging population and the growing obesity epidemic, the incidence of sarcopenic obesity is rising at a rapid pace. The accompaniment of obesity to the poor clinical outcomes of sarcopenia has led to an increase in various clinical complications such as prolonged hospitalization and increased mortality

in the geriatric population (21). Based on NHANES III survey, the prevalence of sarcopenic obesity in people aged ≥60 years was reported as 18.1% in female and 42.9% in male participants (22). In the present study, 60% sarcopenic participants had low or normal BMI values, and the prevalence of sarcopenia was statistically higher in participants with a BMI between 18 and 25 kg/m^2 compared to non-sarcopenic participants. Nevertheless, the fact that 40.8% of the patients were in the overweight or obesity category based on BMI values is supportive of the fact that sarcopenic obesity should not be ignored in sarcopenic patients.

It has been reported that non-pharmacological treatments, including exercise and nutritional supplements, are safer compared to pharmacological treatments in elderly sarcopenic individuals. Systematic reviews and meta-analyses have shown that both exercises alone and the combination of exercise and nutrition have beneficial effects on muscle strength and physical performance, with resistance exercises in particular improving muscle strength and muscle quality in sarcopenic elderly individuals (23,24).

Limitations of the study

The present study has certain limitations, including the relatively small number of patients and the short follow-up period. The walking test, a sarcopenia screening test based on the EWGSOP diagnostic criteria, could not be performed in many patients in the acute stage of the disease, and only the hand grip test was used to evaluate sarcopenia. And finally, there was no muscle mass cut-off value determined for the Turkish population for the purposes of defining sarcopenia; therefore, the BIA values from foreign studies were used. Since there were no patients with a BMI <18 kg/m^2, logistic regression analysis could not be performed regarding the relationship between BMI and the risk of developing sarcopenia. This can also be considered as a limitation of the study. The study has an observational and cross-sectional design, which limits causality. The lack of analysis of confounding variables such as comorbidities, medications, and inflammation markers also constitutes a limitation in the interpretation of the results. Studies evaluating sociodemographic factors (such as age, marital status, disability for activities of daily living, and underweight), behavioral factors (such as smoking, physical inactivity, malnutrition/malnutrition risk, long and short sleep duration, living alone), and disease-related factors (such as diabetes, cognitive impairment, heart diseases, respiratory diseases, osteopenia/osteoporosis, osteoarthritis, depression, falls, anorexia, and anemia) that may be associated with sarcopenia in the future will shed light on this topic.

Conclusion

In the present study, approximately half of the hospitalized geriatric patients were sarcopenic and approximately half of them were malnourished. These results supported that malnutrition was one of the most important risk factors for sarcopenia and that sarcopenia and malnutrition are two conditions that should be simultaneously evaluated in geriatric patients. The association between sarcopenia and malnutrition, as well as the risk of malnutrition, is substantial, indicating that most hospitalized older adults struggle with both of these debilitating conditions during their hospital stay. This highlights the necessity of including screening tools to assess nutritional status and sarcopenia during comprehensive geriatric assessment before or at the time of hospital admission. All older hospitalized individuals should be followed and treated with an appropriate combination of nutritional support and exercise programs as a priority approach for sarcopenia and malnutrition. Furthermore, 40.8% of patients with sarcopenia were overweight or obese based on BMI values, suggesting that sarcopenic obesity should not be ignored in these patients.

References

1. Cruz-Jentoft AJ, Baeyens JP, Bauer JM, et al. Sarcopenia: European consensus on definition and diagnosis: Report of the European Working Group on Sarcopenia in Older People. Age Ageing. 2010;39:412-423.

2. Meng S, He X, Fu X, et al. The prevalence of sarcopenia and risk factors in the older adult in China: a systematic review and meta-analysis. Front Public Health 2024;12:1415398.

3. Cruz-Jentoft AJ, Landi F, Schneider SM, et al. Prevalence of and interventions for sarcopenia in ageing adults: a systematic review. Report of the International Sarcopenia Initiative (EWGSOP and IWGS). Age Ageing 2014;43:748-759.

4. Gariballa S, Alessa A. Sarcopenia: prevalence and prognostic significance in hospitalized patients. Clin Nutr 2013;32:772-776.
5. Sousa AS, Guerra RS, Fonseca I, Pichel F, Amaral TF. Sarcopenia among hospitalized patients - A cross-sectional study. Clin Nutr 2015;34:1239-1244.
6. Martone AM, Bianchi L, Abete P, et al. The incidence of sarcopenia among hospitalized older patients: results from the Glisten study. J Cachexia Sarcopenia Muscle 2017;8:907-914.
7. Beaudart C, McCloskey E, Bruyère O, et al. Sarcopenia in daily practice: assessment and management. BMC Geriatr. 2016;16:170.
8. Lochs H, Allison SP, Meier R, et al. Introductory to the ESPEN Guidelines on Enteral Nutrition: Terminology, definitions and general topics. Clin Nutr. 2006;25(2):180-186.
9. Ligthart-Melis GC, Luiking YC, Kakourou A, Cederholm T, Maier AB, De van der Schueren MAE. Frailty, Sarcopenia, and Malnutrition Frequently (Co-)occur in Hospitalized Older Adults: A Systematic Review and Meta-analysis. J Am Med Dir Assoc 2020;21:1216-1228.
10. Sieber CC. Malnutrition and sarcopenia. Aging Clin Exp Res 2019;31:793-798.
11. Cruz-Jentoft AJ, Kiesswetter E, Drey M, Sieber CC. Nutrition, frailty, and sarcopenia. Aging Clin Exp Res 2017;29:43-48.
12. Vellas B, Guigoz Y, Garry PJ, et al. The Mini Nutritional Assessment (MNA) and its use in grading the nutritional state of elderly patients. Nutrition 1999;15:116-122.
13. Rubenstein LZ, Harker JO, Salvà A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). J Gerontol A Biol Sci Med Sci 2001;56:366–372.
14. Walston JD. Sarcopenia in older adults. Curr Opin Rheumatol 2012;24:623-627.
15. Hu X, Zhang L, Wang H, Hao Q, Dong B, Yang M. Malnutrition-sarcopenia syndrome predicts mortality in hospitalized older patients. Sci Rep 2017;7:3171.
16. Thomas DR. Sarcopenia. Clin Geriatr Med 2010;26:331-346
17. Ozer FF, Akin S, Tasci İ, et al. Risk of sarcopenia in hospitalized patients and related clinical factors: a multicenter study from Turkey. Eur Geriatr Med 2021;12:863-870.
18. Janssen I, Steven B, Heymsfield SB, Ross R. Low relative skeletal muscle mass (sarcopenia) in older persons is associated with functional impairment and physical disability. J Am Geriatr Soc 2002;50:889-896.
19. Tanimoto Y, Watanabe M, Sun W, et al. Sarcopenia and falls in community-dwelling elderly subjects in Japan: Defining sarcopenia according to criteria of the European Working Group on Sarcopenia in Older People. Arch Gerontol Geriatr 2014;59:295-299.
20. Wei S, Nguyen TT, Zhang Y, Ryu D, Gariani K. Sarcopenic obesity: epidemiology, pathophysiology, cardiovascular disease, mortality, and management. Front Endocrinol (Lausanne) 2023;14:1185221.
21. Prado CM, Batsis JA, Donini LM, Gonzalez MC, Siervo M. Sarcopenic obesity in older adults: a clinical overview. Nat Rev Endocrinol 2024;20:261-277.
22. Batsis JA, Mackenzie TA, Barre LK, Lopez-Jimenez F, Bartels SJ. Sarcopenia, sarcopenic obesity and mortality in older adults: results from the National Health and Nutrition Examination Survey III. Eur J Clin Nutr 2014;68:1001-1007.
23. Wu PY, Huang KS, Chen KM, Chou CP, Tu YK. Exercise, Nutrition, and Combined Exercise and Nutrition in Older Adults with Sarcopenia: A Systematic Review and Network Meta-analysis. Maturitas 2021;145:38-48.
24. Zhao H, Cheng R, Song G, et al. The Effect of Resistance Training on the Rehabilitation of Elderly Patients with Sarcopenia: A Meta-Analysis. Int J Environ Res Public Health 2022;19(23):15491.