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Assessment of Nutritional Status of Hospitalised Geriatric Patients and its Relationship with Sarcopenia

Hastanede Yatan Geriatrik Hastaların Nütrisyonel Durumlarının Değerlendirilmesi ve Sarkopeni ile İlişkisinin Saptanması

Aysun Nazlı[1], Elvan Yılmaz Akyüz[2]

[1]University of Health Sciences Turkey, İstanbul Training and Research Hospital, Clinic of Nutrition and Dietetics, İstanbul, Turkey
[2]University of Health Sciences Turkey, Hamidiye Faculty of Health Sciences, Department of Nutrition and Dietetics, İstanbul, Turkey

ABSTRACT

Introduction: Sarcopenia and malnutrition are geriatric syndromes that reduce quality of life and muscle function in old age. This study aimed to evaluate the nutritional status of geriatric patients, determine the status of sarcopenia, and investigate the relationship between them.

Methods: The study was conducted between November 2018 and April 2019 with 100 patients aged ≥65 years who were hospitalised in University of Health Sciences Turkey, İstanbul Training and Research Hospital. The demographic characteristics of the included patients were used to evaluate nutritional status and sarcopenia. The Mini Nutritional Assessment form was used, and anthropometric measurements, bioimpedance analysis method, hand grip strength and time walk test were performed. The patients' treatment clinics, hospitalisation indications, length of hospital stay and comorbidities were determined.

Results: The mean age of the patients was 71.8±6.2 years, and 35% and 65% were women and men, respectively. Malnutrition and risk of malnutrition were observed in 8% and 50% of the patients. In addition, sarcopenia was found in 5% of the patients. A significant relationship was determined among age, weight, height, body mass index (BMI), upper arm circumference measurement and nutritional status. Muscle function adequacy (p=0.00) and hand grip strength test results (p=0.002) were lower, and time walk test results (p=0.00) were longer in malnourished patients compared with those without malnutrition (p<0.05). Weight, BMI, muscle function, and adequacy of muscle mass were significantly lower in patients with sarcopenia compared with those without sarcopenia (p<0.05). The risk of malnutrition was 60% in patients with sarcopenia, and malnutrition in 8.4% of patients without sarcopenia, and malnutrition in 47.5%. The distribution of sarcopenia did not differ based on the nutritional status (p>0.05).

Conclusion: To prevent malnutrition and sarcopenia or their progress in hospitalised patients, nutritional status

ÖZ

Amaç: Sarkopeni ve malnütrisyon, yaşlılık sürecinde yaşam kalitesini ve kas fonksiyonunu azaltan geriatrik sendromlardır. Bu çalışmada hastanede yatan geriatrik hastaların nütrisyonel durumlarının değerlendirilmesi, sarkopeni durumunun saptanması ve aralarındaki ilişkinin incelenmesi amaçlanmıştır.

Yöntemler: Çalışma Kasım 2018 - Nisan 2019 tarihleri arasında Sağlık Bilimleri Üniversitesi İstanbul Eğitim ve Araştırma Hastanesi kliniklerinde yatan ≥65 yaş 100 hasta ile yürütülmüştür. Çalışmaya dahil edilen hastaların demografik özellikleri için veri toplama formu, nütrisyonel durumları ve sarkopeni varlığını değerlendirmek için; Mini Nütrisyonel Değerlendirme formu, antropometrik ölçümler, biyoimpedans analiz yöntemi, el kavrama kuvveti ve zamanlı kalk-yürü testi uygulanmıştır. Hastaların yatarak tedavi gördükleri klinik, yatış süre ve endikasyonu, yandaş kronik hastalık varlığı sorgulanmıştır.

Bulgular: Çalışmaya katılan hastaların yaş ortalamaları 71,8±6,2 yıl ve %35'i kadın, %65'i erkektir. Hastaların %8'inde malnütrisyon ve %50'sinde malnütrisyon riski olduğu tespit edilmiştir. Hastaların %5'inde sarkopeni saptanmıştır. Hastaların yaş, ağırlık, boy, vücut kütle indeksi (VKİ), üst kol çevresi ölçümü ile nütrisyonel durumları arasında anlamlı ilişki saptanmıştır (p<0,05). Malnütrisyonu olan hastalarda olmayan hastalara göre kas fonksiyon yeterliliği daha düşük bulunmuş (p=0,00), zamanlı kalk-yürü testi sonucu daha uzun saptanmış (p=0.00) ve el kavrama kuvvet test sonucunun daha düşük olduğu tespit edilmiştir (p=0,002). Sarkopenisi olan hastalarda sarkopenisi olmayanlara göre ağırlık, VKİ, kas fonksiyonu ve kas kütlesi yeterliliği anlamlı şekilde daha düşük bulunmuştur (p<0,05). Sarkopenisi olan hastaların %60'ında malnütrisyon riski, sarkopenisi olmayan hastaların %8,4'ünde malnütrisyon ve %47,5'inde malnütrisyon riski saptanmıştır. Hastaların nütrisyonel durumlarına göre sarkopeni varlığı dağılımları farklılık göstermemiştir (p>0,05).

Sonuç: Hastanede yatan hastalarda malnütrisyon ve sarkopeni gelişmemesi veya ilerlememesi için; hastaneye yatış

Address for Correspondence/Yazışma Adresi: Aysun Nazlı, University of Health Sciences Turkey, İstanbul Training and Research Hospital, Clinic of Nutrition and Dietetics, İstanbul, Turkey
Phone: +90 546 200 65 07 **E-mail:** aysunnazli@outlook.com **ORCID ID:** orcid.org/0000-0002-1168-6592

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and sarcopenia should be evaluated, and patients should be treated and followed up during hospitalisation. Regardless of nutritional status, all hospitalised elderly patients should be controlled for the risk of sarcopenia.

Keywords: Sarcopenia, malnutrition, nutrition, sarcopenic obesity, ageing

esnasında hastaların beslenme durumları ve kas kayıpları değerlendirilmeli, tedavi ve takibi yapılmalıdır. Nütrisyonel durumdan bağımsız olarak hastanede yatan tüm yaşlı hastalar sarkopeni riski açısından kontrol edilmelidir.

Anahtar Kelimeler: Sarkopeni, malnütrisyon, nütrisyon, sarkopenik obezite, yaşlılık

Introduction

With the improved technology and the improvement of living conditions, it has been observed that death rates on earth have decreased and life expectancy has increased. The number of geriatric patients who lack self-care, have chronic disease and need care and treatment has increased due to prolonged life expectancy and deteriorating body homeostasis with aging. The World Health Organization (WHO) has stated that the population aged ≥65 increases by about 5% per year in developing and developed countries (1,2).

With the interaction of progressive age and chronic diseases on many systems, geriatric syndromes that disrupt the comfort of life, which are not fully explained by the definition of the disease, and which can increase the mortality rate are occurring (2). These geriatric syndromes are neurological diseases, inactivity, anxiety, delirium, dementia, falls, pressure wound, osteoporosis, fragility, malnutrition and sarcopenia (3).

Malnutrition, characterized by weight loss, decreased muscle power, increased morbidity and mortality, is the occurrence of clinical pathologies in body functions as a result of deficient or excessive intake of energy, macro and micronutrients. Mental health problems, lack of self-care, skipping meals, missing nutrient intake, chronic disease, dysphagia, neurological disorders, social problems, dental problems, excessive drug use, reduced physical activity and hospital-acquired infections; are specified as conditions that cause malnutrition (4,5). A gold standard Mini Nutritional Assessment (MNA) form developed by the European Society for Clinical Nutrition and Metabolism for geriatric patients in nursing homes and hospitals is recommended for malnutrition screening (5).

Sarcopenia, which is caused by aging, decreased physical movement, malnutrition and decreased anabolic hormones, and is characterized by falling, disability, loss of mass and muscle strength, is another geriatric syndrome (6). The sarcopenia algorithm proposed by the European Working Group on Sarcopenia in Older People (EWGSOP), established by the European Union Geriatric Medicine Society, is used to determine the presence of sarcopenia. In this algorithm; sarcopenia is detected by evaluating the walking speed and muscle function of the geriatric individuals, muscle strength measurement with the hand grip force test and measuring muscle mass with the help of devices (7).

After detection and evaluation of malnutrition and sarcopenia, a multidisciplinary team (doctor, dietician, nurse) should plan effective nutritional interventions and a physical movement schedule that meets the patient's needs, including both the patient and their families/caregivers (4). In our study, it was aimed to evaluate the nutritional status of geriatric patients in İstanbul Training and Research Hospital Clinics for more than 24 hours, to determine sarcopenia status and to examine the relationship between them.

Materials and Methods

This descriptive and cross-sectional study consisted of 100 patients ≥65 years of age and who agreed to participate in the University of Health Sciences Turkey, İstanbul Training and Research Hospital clinics for more than 24 hours between November 2018 and April 2019. The study was carried out with the approval of Health Sciences University's Hamidiye Ethics Committee (decision no: 46418926-050.03.04) and with written consent from the patients.

Demographic data of the patients (age, gender), anthropometric measurements [body weight, height, body mass index (BMI), right-upper arm circumference, lower right calf circumference], Bio-impedance analysis (BIA) device measurements, hand dynamometer, timed up-and-move (3m walk test) test measurements and the MNA form scores were recorded. In addition, the duration and indications of hospitalization of patients, the service in which they received inpatient treatment, the presence of additional chronic disease were questioned.

The consciousness of the patient, sufficient walking function, lack of hand limitation and being in a position to be weighed were determined as the inclusion criteria. Patients who were in a bad condition (hemiplegic, over-edematous), unable to communicate (psychological disorders), gait disturbance, hand function limitation, previous cerebrovascular disease history, advanced dementia, Parkinson's disease and such neurological diseases were excluded from the study.

The MNA form was applied to all patients by the researcher to determine the nutritional status of the patients. According to the score on the form <17 points malnutrition, 17-23.5 points malnutrition risk and >24 points were determined as normal nutritional status (5).

The length of the patients was measured by ground-fixed, calibrated scale brand DR-MOD.85. Body weight, BMI and muscle mass measurements of the patients whose height was measured were done with BIA device (TANITA brand, SC-330 model). The skeletal muscle formula recommended by Janssen et al. (8) was used to determine the muscle mass of the patients whose weight was measured, and the muscle mass was obtained by dividing the calculated skeletal muscle amount by the square of the height length.

Hand grip test was used for muscle strength measurements. The hand grip test was carried out with the SAEHAN sh5001 model hand dynamometer. According to EWGSOP criteria, the hand grip strength required for sarcopenia was determined as cutting points; 30 kg for

men and 20 kg for women (7). The Timed Up & Go (TUG) test was used to evaluate the muscle function of the patients, and patients whose duration lasted longer than 15 seconds were considered to have decreased muscle function (2,9). EWGSOP algorithm based on TUG test, hand grip strength and muscle mass measurement was used to determine sarcopenia (7). In order to evaluate the status of sarcopenic obesity, the sarcopenia diagnostic criteria proposed by EWGSOP and the BMI values proposed by WHO were used in the evaluation of obesity. Patients with BMI greater than 30 were considered obese. Patients with obesity and sarcopenia were considered to be "sarcopenic obese patients" (1,7).

Statistical Analysis

SPSS (Statistical Package for Social Sciences) 22.0 package program was used for statistical analysis of the data. Mean, standard deviation, median lowest, highest, frequency and ratio values were used in the descriptive statistics of the data obtained from the research. The distribution of variables was measured by Kolmogorov Simirnov test. The Mann-Whitney U test was used in the analysis of quantitative independent data, the chi-square test was used in the analysis of qualitative independent data, and the Fisher exact test was used when the conditions for the chi-square test were not met.

Results

Of the total 100 patients included in the study, 35% were female and 65% were male. The mean age was 71.8±6.2 years (minimum: 65-maximum: 88). 56% of the patients included in the study were treated in physical therapy and rehabilitation, 24% in internal medicine, 8% in urology, 6% in otolaryngology and 6% in other hospital clinics.

Malnutrition was found in 8% of patients, malnutrition risk was found in 50% and normal nutrition was found in 42%. In this study, malnutrition and malnutrition risk group were discussed together. Therefore, the data were grouped and evaluated as the group of patients with malnutrition status and the group of patients without malnutrition status. 5% of patients met sarcopenia criteria, while 95% did not meet sarcopenia criteria. Sarcopenic obesity was seen in only one person (1%) out of 100 patients. The distribution of chronic disease, nutrition, sarcopenia, sarcopenic obesity and muscle adequacy of the patients is shown in Table 1.

Of the patients with malnutrition, 67.2% (n=39) were male and 32.8% (n=19) were female. Gender distribution and presence of chronic disease were not significantly different in groups of patients with and without malnutrition (p=0.581, p=0.166). Obesity is present in 51.7% of patients with malnutrition, while not present in 48.3%. Malnutrition was also detected in 1 (1%) patient with sarcopenic obesity. Sarcopenic obesity was not found in patients without malnutrition. The presence of obesity and sarcopenic obesity were not significantly different in the group with and without malnutrition (p=0.210, p=1.000) (Table 2).

While mean age of patients with malnutrition was 73.0±6.0, without malnutrition was 70.0±6.1 and significant difference was found between the groups (p=0.004). The duration of hospitalization was 6.0±5.2 in patients without malnutrition and 7.3±4.8 in patients with malnutrition and there was a significant difference between the groups (p=0.045). Anthropometric measurements of the patients according to their nutritional status are shown in Table 3.

80% of 5 patients with sarcopenia were female and 20% were male. In 80% of patients with sarcopenia, 75.8% of those without sarcopenia had chronic disease (p=1,000), (Table 4).

Mean age, duration of hospitalization and MNA scores of patients with sarcopenia were higher than those without sarcopenia, but no difference was found between them (p<0.05). Weight and BMI values of patients with sarcopenia were lower (p=0.049, p=0.028). No significant difference was observed in other anthropometric measurements (Table 5).

Sarcopenia was not seen in patients with malnutrition. The risk of malnutrition was found in 60% of patients with sarcopenia, normal nutrition in 40%; malnutrition in 8.4% of patients without sarcopenia, malnutrition risk in 47.5% and normal nutrition in 42.1%. The distribution of sarcopenia presence did not differ significantly according to the nutritional status of the patients (p=0.926).

Discussion

Sarcopenia and malnutrition are geriatric syndromes that reduce Novartis function and quality of life in old age (3). In this study, it was determined that geriatric patients in hospital may develop sarcopenia regardless of the presence of malnutrition, therefore patients should also be evaluated for sarcopenia.

One of the secondary results of sarcopenia and malnutrition is prolonged hospitalization (6). In studies where malnutrition and sarcopenia status of hospitalized patients were examined, the duration of hospitalization was found to be longer in patients with malnutrition

Table 1. Distribution of disease, nutritional status and muscle adequacies of patients

	Situation	Number (n)	Percent (%)
Chronic disease	Yes	76	76
	No	24	24
Obesity	Yes	57	57
	No	43	43
Malnutrition	Yes	8	8
	There is a risk	50	50
	No	42	42
Sarcopenia	Yes	5	5
	No	95	95
Muscle function adequacy	Yes	50	50
	No	50	50
Muscle strength adequacy	Yes	26	26
	No	74	74
Muscle mass adequacy	Yes	95	95
	No	5	5
Sarcopenic obesity	Yes	1	1
	No	99	99

and sarcopenia (10,11). In our study, different from the literature, the duration of hospitalization was significantly higher in non-malnutrition patients and did not differ according to sarcopenia status. The reason for this condition is that the majority of patients are patients with good nutritional conditions who have been in the physical therapy and rehabilitation clinic for long periods of time for treatment.

The prevalence of malnutrition or malnutrition risk in geriatric patients is between 30-60% (12,13). In one study, 26.9% malnutrition, 46.6% malnutrition risk, 26.5% normal nutrition were indicated (14). In this study, malnutrition was identified in 8% of patients, malnutrition risk in 50% and normal nutrition in 42%. We believe that the proportion of patients with malnutrition is low due to the fact that most diseases that can cause malnutrition are within the exclusion criteria.

Although sarcopenia prevalence varies according to institutions, societies, gender distribution, diagnostic tools and schemes used and age groups, a community-based study in Turkey found sarcopenia in 5.2% of geriatric individuals according to EWGSOP criteria (15). In other studies conducted according to the EWGSOP scheme, the prevalence of sarcopenia was 7.5% and 4.5% respectively (16,17). Similarly, sarcopenia was detected in 5% of patients in this study.

Low walking speed, which is positively correlated with decreased muscle function and decreased physical performance, is one of the evaluation criteria that reflects the sarcopenia and malnutrition conditions of patients. Low walking speed is thought to be related to patients with sarcopenia and malnutrition to have muscle mass lose and muscle strength loss in their lower extremities (18). In studies conducted on geriatric individuals, it was reported that walking time was longer than those without malnutrition and muscle function was lower (19,20). In geriatric patients with sarcopenia, the results of the TUG test, lower limb strength test results, and physical capacity scores reflecting muscle

Table 2. Gender, obesity, sarcopenic obesity, muscle competence according to the presence of malnutrition in patients

Number (n)		Malnutrition Yes		Malnutrition No		
		Number (%)	Percent (n)	Number (%)	Percent (%)	p
Gender	Female	19	32.8	16	38.1	0.581 $^{x^2}$
	Male	39	67.2	26	61.9	
Chronic disease	Yes	47	81	29	69	0.166 $^{x^2}$
	No	11	19	13	31	
Obesity	Yes	30	51.7	27	64.3	0.210 $^{x^2}$
	No	28	48.3	15	35.7	
Sarcopenic obesity	Yes	1	1.7	0	0	1.000 $^{x^2}$
	No	57	98.3	42	100	
Muscle function adequacy	Yes	20	34.5	30	71.4	0.000 $^{x^2}$
	No	38	65.5	12	28.6	
Muscle strength adequacy	Yes	11	19	15	35.7	0.059 $^{x^2}$
	No	47	81	27	64.3	
Muscle mass adequacy	Yes	55	94.8	40	95.2	0.926 $^{x^2}$
	No	3	5.2	2	4.8	

$^{x^2}$: chi-square test

Table 3. Anthropometric measurements of patients according to their nutritional status

	Malnutrition Yes	Malnutrition No	p
	Mean ± SD	Mean ± SD	
Body weight (kg)	72.1±13.4	80.9±11.5	0.002 ^{m}
Height (cm)	155.4±9.1	158.7±7.6	0.039 ^{m}
BMI (kg/m²)	29.9±5.7	32.2±5.2	0.049 ^{m}
Upper arm circumference (cm)	25.9±4.3	28.5±4.5	0.013 ^{m}
Lower calf circumference (cm)	37.3±4.9	47.8±56.2	0.313 ^{m}
Hand grip force (kg)	18.4±10.1	22.3±6.8	0.002 ^{m}
Timed Up & Go test (s)	18.3±8.3	13.9±3.4	0.000 ^{m}
Skeletal muscle (kg)	22.9±5.5	24.4±5.5	0.131 ^{m}
Muscle mass (kg/m²)	9.4±1.6	9.6±1.6	0.386 ^{m}

^{m}: Mann-Whitney U test, BMI: body mass index, SD: standard deviation

Table 4. Gender, obesity, sarcopenic obesity, muscle competencies according to the patients' sarcopenia status

Number (n)		Sarcopenia Yes		Sarcopenia No		
		Number (n)	Percent (%)	Number (n)	Percent (%)	p
Gender	Female	4	80	31	32.6	0.050 x^2
	Male	1	20	64	67.4	
Chronic disease	Yes	4	80	72	75.8	1,000 x^2
	No	1	20	23	24.2	
Obesity	Yes	1	20	56	58.9	0.086 x^2
	No	4	80	39	41.1	
Sarcopenic obesity	Yes	1	20	0	0	0.050 x^2
	No	4	80	95	100	
Muscle function adequacy	Yes	0	0	50	52.6	0.022 x^2
	No	5	100	45	47.4	
Muscle strength adequacy	Yes	0	0	26	27.4	0.323 x^2
	No	5	100	69	72.6	
Muscle mass adequacy	Yes	0	0	95	100	0.000 x^2
	No	5	100	0	0	

x^2: chi-square test

Table 5. Demographic characteristics and anthropometric measurements of patients with sarcopenia

	Sarcopenia Yes	Sarcopenia No	
	Mean ± SD	Mean ± SD	p
Age (Year)	73.0±4.5	71.7±6.3	0.460 m
Duration of stay (days)	6.8 ±3.6	6.5±5.1	0.575 m
Body weight (kg)	67.1±5.8	76.3±13.5	0.049 m
Height (cm)	160.0±11.2	156.6±8.5	0.491 m
BMI (kg/m²)	26.3±2.5	31.1±5.6	0.028 m
Upper arm circumference (cm)	25.2±3.0	27.1±4.6	0.289 m
Lower calf circumference (cm)	34.0±2.9	42.1±37.7	0.064 m
Timed up & walk test (seconds)	16.3±1.5	16.4±7.2	0.472 m
Hand grip force (kg)	22.3±8.5	20.0±9.1	0.472 m
MNA score	23.5±1.6	22.0±4.4	0.511 m
Skeletal muscle (kg)	21.4±5.1	23.6±5.5	0.532 m
Muscle mass (kg/m²)	8.2±1.0	9.5±1.6	0.131 m

m: Mann-Whitney U test, BMI: body mass index, SD: standard deviation, MNA: Mini Nutritional Assessment

functions were shown to decrease (18). In this study, similar to previous studies, muscle dysfunction was found in more than half of patients with malnutrition and in all patients with sarcopenia.

The BMI scale used in older adults was differentiated from the adults by the shortening of length due to the increase in age. BMI, which reflects malnutrition status in older individuals, is accepted as <22 kg/m² (5). Our study found that both malnutrition and sarcopenia patients had lower BMI than those who did not. In a study, a higher proportion of sarcopenia was found in patients with BMI below 24.99 kg/m² (21). In a study in which BMI values were investigated according to the nutritional status of patients, it was stated that patients' BMI was an important factor in the occurrence of malnutrition (22).

Sarcopenia is not only seen in individuals with low weight, but also in individuals with excess body weight. The condition in which sarcopenia is present alongside obesity caused by increased fat mass is called sarcopenic obesity (23). In a study investigating the prevalence of sarcopenic obesity, 12.5% of women and 5% of men were diagnosed with sarcopenic obesity (24). Another study found that out of 171 patients undergoing surgical operations, 46.8% were sarcopenic and 28.7% were sarcopenic obese. (9). In this study, obesity was found in 57% of patients and sarcopenic obesity in 1%. 51.7% of patients with malnutrition were obese, 1.7% were sarcopenic obese; 20% of patients with sarcopenia were obese and sarcopenic obese.

Hand grip strength test is often preferred to measure muscle strength in determining malnutrition and sarcopenia (7). Springstroh et al. (25) found that hand grip forces of older adults living in the community were associated with malnutrition and indicated that hand grip strength could be used to detect malnutrition. A study also found that poor nutrition causes inadequacy of muscle strength in older individuals (26). In our study, hand grip strength averages were lower in patients with malnutrition than in those without, and muscle strength inadequacy

were found in 81% of patients with malnutrition. This situation can be explained by the loss of muscle strength due to malnutrition.

It is known that the increase in physical performance assessed by the lower limb strength test and gait test reduces the need for help and improves the comfort of life during the geriatric period (18). In our study, the mean TUG test result was significantly lower in patients with malnutrition than in patients without malnutrition. Similar studies have also reported that the risk of malnutrition is directly related to slow walking speed (20,27).

Sarcopenia is characterized by loss or inability to novelize muscle mass (2). Dufour et al. (28) observed that low muscle mass, increased fat ratio and body size were associated with sarcopenia in their study. In this study, muscle mass was found to be insufficient in 5% of all patients, 5.2% of patients with malnutrition and 100% of patients with sarcopenia. Using the formula proposed by Janssen et al. (8), in geriatric individuals in Turkey in a study investigating the adequacy of muscle mass, it was found to have a higher muscle mass than expected adequacy of the patients. We think that the similar situation observed in our study is due to the high threshold value of the formula used for Turkish society.

Weight loss increases lean mass loss and sarcopenia due to aging (9). In a study, body weight was significantly lower in individuals with sarcopenia than in individuals without sarcopenia (29). Another study reported that body size should be considered in the case of sarcopenia (28). In our study, we found that patients with sarcopenia had significantly lower weight averages than those who did not. It is predicted that this is due to the loss of weight due to old age and chronic diseases, causing muscle loss.

Limitations of Research

Since the study was a cross-sectional type and single-center study, it was possible to reach a limited number of patients in a limited period of time.

Conclusion

In this study, the risk of malnutrition and malnutrition were detected in more than half of geriatric patients, and it was shown that sarcopenia may develop regardless of nutritional status. For this reason, the nutritional status of geriatric patients should be questioned in detail and risk screening should be done to prevent the early diagnosis and treatment of malnutrition and sarcopenia.

Ethics

Ethics Committee Approval: The study was carried out with the approval of Health Sciences University's Hamidiye Ethics Committee (decision no: 46418926-050.03.04).

Informed Consent: Written consent from the patients.

Peer-review: Externally and internally peer-reviewed.

Authorship Contributions: Concept - A.N., E.Y.A.; Design - A.N., E.Y.A.; Data Collection or Processing - A.N.; Analysis or Interpretation - A.N., E.Y.A.; Literature Search - A.N.; Writing - A.N.

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