Original Article

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Prevalence of Sarcopenic Obesity and Associated Factors in Older Adults

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Abstract

Aim: Sarcopenia is a significant contributor to morbidity and mortality, with unfavorable consequences. The present study investigated the prevalence of sarcopenia associated with obesity, referred to as sarcopenic obesity, and the associated factors.

Methods: This was a cross-sectional study, which was a type of retrospective observational study. The study included patients aged ≥65 years who were treated outpatiently between May 2020 and February 2022. The study population was divided into two groups: the SO group and the SO group alone. In the univariate analyses, we investigated the relationship between age, sex, number of medications, polypharmacy, comorbid conditions, frailty, and undernutrition in the two groups. The parameters found to be related to each group in the univariate analyses were further evaluated using multivariate analyses.

Results: Among the 367 participants, the median age was 71 years (65-97). The proportion of cases with sarcopenic obesity was 15.3% (n=56), whereas the proportion of individuals with sarcopenia but without obesity was 16.6% (n=61). In the multivariate analysis, age (p=0.001) and frailty (p<0.001) were found to be factors associated with SO.

Conclusion: The prevalence of sarcopenia in older adults with obesity is similar to that in those with obesity, although female sex and frailty stand out as factors with a particular association with sarcopenic obesity.

Keywords: Sarcopenia, obesity, elderly

Introduction

The aging process has been shown to lead to alterations in body composition, including increased visceral fat deposition and decreased muscle mass (1-4). In older adults, a decrease in muscle mass is associated with sarcopenia, whereas an increase in visceral fat is associated with a tendency toward obesity (1-4). Sarcopenia has been identified as a significant geriatric health problem associated with adverse consequences, such as falls, frailty, physical disability, institutionalization, and an elevated risk of mortality (5,6).

The European Working Group on Sarcopenia in Older People 2 (EWGSOP 2) was published in an attempt to describe sarcopenia using various definitions and methods (1) and recommends the use of the SARC-F test for sarcopenia screening (1). Recent studies have introduced the novel concept of sarcopenic obesity to the lexicon, referring to sarcopenia combined with obesity (1-4). The rapidly increasing prevalence of SO and its serious consequences have become critical public health problems in the aging population (1-4). Sarcopenia and obesity share numerous pathophysiological mechanisms, and the two conditions can exacerbate each other (1,2).

We aimed to investigate the prevalence of SO and the potential associated factors using screening methods in patients aged 65 years or older who presented to internal medicine outpatients.

Methods

Compliance with Ethical Standards

This study was conducted in accordance with the principles outlined in the revised form of the 2013 Declaration of Helsinki. The Clinical Researches Ethics Committee of the University of Health Sciences Turkey,

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Kartal Dr. Lutfi Kirdar City Hospital approved the study (approval no.: 2022/514/224/28, date: 27.04.2022). Written informed consent was obtained from all participants.

Participants

The data of patients aged 65 years or older who presented to the internal medicine outpatient department for routine control visits between May 30, 2020, and February 1, 2022 were retrospectively reviewed. Patients who had records that showed how many other conditions were found during exams, how many medications they were taking, their height and weight, and whether they had any geriatric syndromes (like sarcopenia, frailty, and malnutrition), were included in the study. Those who declined to undergo screening tests during routine control visits and those who were unable to respond to the questions due to cognitive problems were excluded from the study (Figure 1).

Data Collection

The number of comorbid conditions, number of medications, and height and weight measurements of the participants were recorded during the examinations. Polypharmacy was defined as the consumption of four or more medications (7), and obesity was defined as a body mass index (BMI) of 30 kg/m^2 or greater (8). Sarcopenia screening was performed using the SARC-F questionnaire, in which a score of 4 or higher was considered to indicate sarcopenia (4); frailty was identified as a score of 3 or higher on the FRAIL questionnaire (9); malnutrition was screened using the mini nutritional assessment-short form (10), in which a score of 11 or lower was considered indicative of undernutrition; and sarcopenic obesity was identified as a BMI of 30 kg/m^2 or greater, combined with a SARC-F score of 4 or higher (4,8), whereas a BMI lower than 30 kg/m^2 and a SARC-F score of 4 or greater was identified as sarcopenia without obesity (4).

Statistical Analysis

IBM SPSS Statistics software was used for the statistical analysis of the study data. Study data were expressed in a suitable statistical format depending on their fitness to a normal distribution. The data distribution was determined using the Kolmogorov-Smirnov test. For paired comparisons, a chi-square test was employed for the analysis of nominal data, while a Mann-Whitney U test was used for variables without a normal distribution. In the paired analyses, multicollinearity was assessed among variables that exhibited a significant association with SO, and factors without multicollinearity that demonstrated a significant association were further

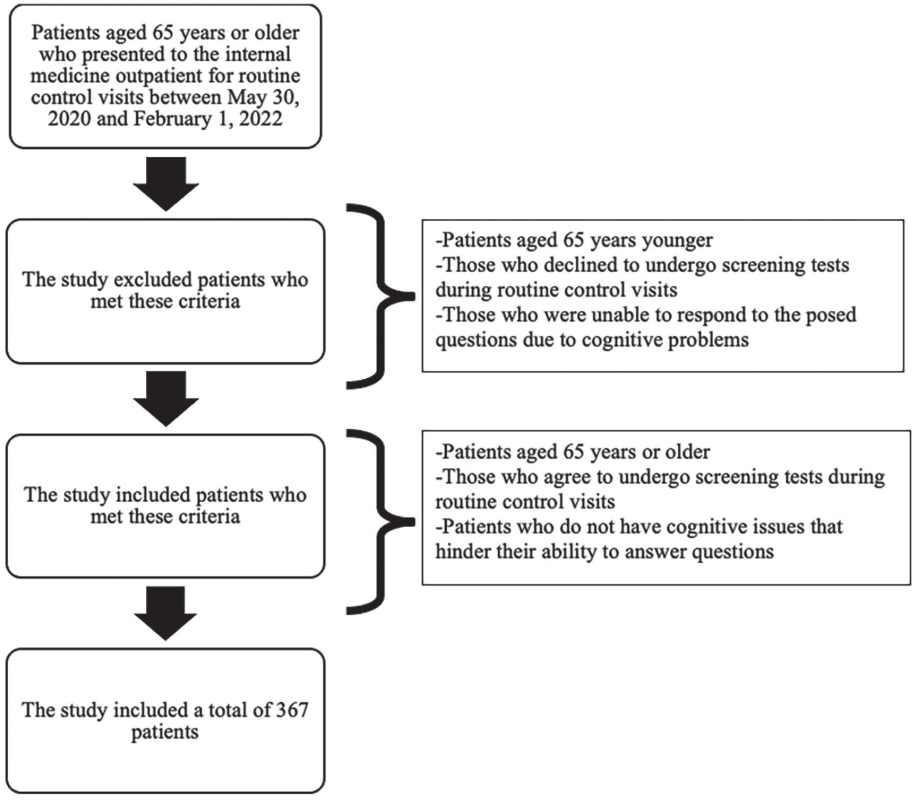

Figure 1. Flowchart of patient selection

examined using regression analysis. Factors demonstrating a significant association are expressed using odds ratios with corresponding confidence intervals. The statistically significant value was determined as p<0.05.

Results

Included in the study were 367 patients, of whom 212 (57.8%) were women, and the median age was 71 years (65-97 years). Of the participants, 200 (54.5%) had diabetes and 160 (43.6%) had polypharmacy. The prevalence rates of geriatric syndromes such as obesity, sarcopenia, frailty, and undernutrition were 41.4% (n=152), 31.9% (n=117), 29.4% (n=108), and 42.5% (n=156), respectively. In the study population, 15.3% had both obesity and sarcopenia, 16.6% had sarcopenia without obesity, 26.2% had obesity without sarcopenia, and 42% were neither obese nor sarcopenic (Table 1).

In the paired analyses, age, sex, number of medications, polypharmacy, number of comorbid conditions, frailty, and undernutrition were found as factors associated with sarcopenic obesity in older adults (p-values in respective order: p=0.037, p<0.001, p=0.003, p=0.012, p=0.009, p≤0.001, p=0.035), while age, polypharmacy, frailty, and undernutrition were identified as factors associated with sarcopenia without obesity (p-values in respective order: p<0.001, p=0.036, p<0.001, p=0.002) (Table 2).

Table 1. Baseline data's of study population

Age*	71 (65-97)
Sex	
Female	212 (57.8%)
Male	155 (42.2%)
Number of medications	4 (0-15)
Polypharmacy	160 (43.6%)
Number of chronic diseases	3 (0-7)
Diabetes mellitus	200 (54.5%)
Presence of obesity	152 (41.4%)
BMI (kg/m^2)*	28.7 (16.8-66.2)
Sarcopenia Screening (SARC-F4)	117 (31.9%)
Frailty (FRAIL scale ≥3)	108 (29.4%)
Undernutrition (MNA-SF ≤11)	156 (42.5%)
Body phenotype	
Obesity and sarcopenia	15.3% (56)
Non-obese and sarcopenic	16.6% (61)
Obese and non-sarcopenic diet	26.2% (96)
Non-obese and nonsarcopenic	42% (152)

Data are presented as mean ± standard deviation or number (percentage) as applicable.
*Data are presented as median.
MNA-SF: Mini nutritional test-short form, BMI: Body mass index

In the multivariate analysis, sex [odds ratio (OR)=0.261, 95% confidence interval (CI) (0.122-0.558), p=0.001] and frailty (OR=4.958, 95% CI (2.541-9.675), p<0.001) were found as factors associated with SO (Table 3), whereas age (OR=1.117, 95% CI (1.061-1.176), p<0.001) and frailty (OR=7.741, 95% CI (3.964-15.119), p<0.001) were found as factors associated with sarcopenia without obesity (Table 4).

The multivariate analysis revealed that frailty was associated with both SO and sarcopenia without obesity, and SO was associated with female sex (Tables 3 and 4).

Discussion

In the present study, a prevalence of sarcopenia of 31.9% was identified in the sample, of which 15.3% of the cases had SO and 16.6% had sarcopenia without obesity. Female sex and frailty were identified as factors associated with SO.

In a cross-sectional study conducted by Öztürk et al. (11) involving a comprehensive geriatric assessment of 423 outpatients aged 65 years or older in the Southeastern region of Turkey, a prevalence of sarcopenia alone (sarcopenia without obesity) of 15% was reported based on the EWGSOP1 criteria (combining decreased muscle mass with decreased performance status), whereas the prevalence of SO was 11% (11). The study by Öztürk et al. (11) did not include an assessment of frailty; however, sarcopenic obesity was found to be associated with lower

Table 2. Related factors with sarcopenic obesity and alone sarcopenia in univariate analyses

	Obesity and sarcopenia (SARC-F4)	p-value	Non-obese sarcopenia (SARC-F 4)	p-value
	56 (15.3%)	N/A	61 (16.6%)	N/A
Age$^{\beta}$	72 (66-90)	0.037$^{\Theta}$	76 (65-92)	<0.001$^{\Theta}$
Sex$^{\beta}$ Female Male	46 (82.1%) 10 (17.9%)	<0.001$^{\Theta}$	34 (55.7%) 27 (44.3%)	0.725
Number of medications	5 (0-14)	0.003$^{\Theta}$	5 (0-15)	0.060
Polypharmacy$^{\beta}$	33 (58.9%)	0.012$^{\Theta}$	34 (55.7%)	0.036$^{\Theta}$
Number of chronic diseases	3 (0-7)	0.009$^{\Theta}$	3 (0-6)	0.098
Presence of diabetes mellitus$^{\beta}$	35 (62.5%)	0.191	33 (54.1%)	0.949
Frailty (FRAIL scale 3)$^{\beta}$	37 (66.1%)	<0.001$^{\Theta}$	44 (72.1%)	<0.001$^{\Theta}$
Undernutrition (MNA-SF 11)$^{\beta}$	31 (55.4%)	0.035$^{\Theta}$	37 (60.7%)	0.002$^{\Theta}$

Data are presented as mean ± standard deviation or number (percentage) as applicable.
*Data are presented as median, $^{\Theta}$Significant p-value, Mann-Whitney U test, $^{\beta}$Chi-square test
MNA-SF: Mini nutritional test-short form

mini-mental state assessment scores, higher geriatric depression scores, and an increased risk of falls, while no association with malnutrition was identified. The study by Öztürk et al. (11) is consistent with the present study in its reporting of the prevalence of SO and the predominance of females in this cohort, although the two studies differ in terms of the assessment of different variables for their association with sarcopenia.

In a prospective observational study of 350 older patients hospitalized in the geriatrics unit, Atmis et al. (12) investigated the association between two-year mortality and both sarcopenia without obesity and sarcopenic obesity, defining sarcopenia based on the EWGSOP 1 criteria (combining decreased muscle mass with either decreased muscle strength or low performance status) and obesity using body fat percentage. They reported a prevalence of 21.1% for sarcopenic obesity and 11.4% for sarcopenia without obesity (6). The prevalence rates reported by Atmis et al. (12) differed from those in the present study, which can be attributed to the different definitions of obesity and sarcopenia adopted, as well as the specific focus on inpatients in their study.

de Lima et al. (13) conducted a cross-sectional study that examined 106 older adults aged 60 years and over regarding malnutrition, frailty, and sarcopenia; they defined frailty by FRAIL, sarcopenia by SARC-F, and obesity by BMI. Their study found that frailty was associated with sarcopenia but not obesity. We believe that this difference may be attributable to the different prevalences of frailty in obese older adult patients. Additionally, unlike our results, de Lima et al. (13) found that malnutrition, which they evaluated using the Simplified Nutritional Appetite Questionnaire, was associated with sarcopenia in their study. The results of their study differ from our study's results. This difference is due to the different methods they used to screen for malnutrition and the fact that they did not adjust for important factors such as polypharmacy.

Yang et al. (14) conducted a retrospective cross-sectional study to examine the relationship between SO and frailty in 2372 older adults. In their study, they found a relationship between SO and frailty, similar to the results of our study (14). Similarly, Frisoli et al. (15) found in the results of their cross-sectional study, which included 371 elderly participants aged 60 years and over, that there was a significant relationship between sarcopenic obesity and frailty, similar to the results of our study.

Table 3. Factors related to SO in multivariate analysis[X]

	p-value	OR	95 %CI	
			Lower	Upper
Age	0.297	1.029	0.975	1.087
Sex	0.001[Θ]	0.261	0.122	0.558
Polypharmacy	0.108	1.690	0.891	3.204
Frailty	<0.001[Θ]	4.958	2.541	9.675
Undernutrition	0.710	1.132	0.589	2.174

[X]Regression analysis
[Θ]Significant p-values
CI: Confidence interval, OR: Odds ratio

Table 4. Factors associated with alone sarcopenia in multivariate analysis[X]

	p-value	OR	95% CI	
			Lower	Upper
Age	<0.001[Θ]	1.117	1.061	1.176
Polypharmacy	0.927	1.031	0.539	1.974
Frailty	<0.001[Θ]	7.741	3.964	15.119
Undernutrition	0.132	1.655	0.859	3.187

[X]Regression analysis, [Θ]Significant p-values
CI: Confidence interval, OR: Odds ratio

Study Limitations

In a study of 1,366 outpatients aged 60 years, Ozkok et al. (4) reported a prevalence rate of 7.5% for SO and 2.8% for sarcopenia alone, defining obesity based on body fat percentage and sarcopenia based on handgrip strength, and identified an association between frailty and both SO and sarcopenia (4). The higher prevalence rate reported in the present study can be attributed to the use of the SARC-F questionnaire, which is a fundamental test for screening sarcopenia, although both sarcopenia phenotypes exhibit similar characteristics in terms of frailty. In a recent meta-analysis, the prevalence of sarcopenic obesity was noted to vary significantly due to the use of different definitions, although both studies reported an association between SO and frailty (16).

The present study's strengths include its status as one of the few studies of its kind to date that involved a substantial number of patients, allowing an accurate determination of the prevalence of SO and its associated factors among older outpatients in our catchment area. The retrospective nature of the study prevents the establishment of any cause-and-effect relationship due to the lack of follow-up data on patients.

Conclusion

This study revealed that SO is a prevalent geriatric syndrome among older adult outpatients. We concluded that female sex and frailty contribute to SO.

Ethics

Ethics Committee Approval: The Clinical Researches Ethics Committee of the University of Health Sciences Turkey, Kartal Dr. Lutfi Kirdar City Hospital approved the study (approval no.: 2022/514/224/28, date: 27.04.2022).

Informed Consent: Written informed consent was obtained from all participants.

Authorship Contributions

Surgical and Medical Practices: T.O.V., Concept: M.E.B., Design: M.E.B., Data Collection or Processing: T.O.V., Analysis or Interpretation: M.E.B., Literature Search: M.E.B., T.O.V., Writing: M.E.B.

Conflict of Interest: No conflicts of interest were declared by the authors.

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