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THE ASSOCIATION BETWEEN DIFFERENT BODY COMPOSITION TYPES AND DEPRESSIVE SYMPTOMS IN OLDER ADULTS

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Keywords: sarcopenia, obesity, sarcopenic obesity, depressive symptoms.

Summary

Objectives: To examine the association between different body composition types and depressive symptoms in the elderly.

Patients and methods: A retrospective cross-sectional study was performed in outpatient clinic based in Vilnius and included community dwelling men and women aged ≥65 years. The exclusion criteria were: moderate and severe cognitive impairment, acute illness, and diseases with advanced organ failure. Criteria for diagnosis of sarcopenia, proposed in 2018 by the European Working Group on Sarcopenia in Older People were used in this study. Muscle strength was assessed by handgrip strength. Muscle mass was measured by dual-energy X-ray absorptiometry (iDXA, GE Lunar, USA). Physical performance was evaluated by short physical performance battery. Obesity was defined if the percentage of body fat measured by DXA. Sarcopenic obesity was determined if both sarcopenia and obesity were present. Depressive symptoms were examined using the 15-item Geriatric Depression Scale (GDS).

Results: We analyzed data of 246 study participants: 87 men (35.4%) and 159 women (64.6 %) aged 65 years or older. According to body composition, participants were categorized in to four groups: obesity (46.7 %), normal (37 %), sarcopenia (8.9 %), sarcopenic obesity (7.3 %). Out of all participants 91 (37 %) scored <5 on the GDS, 106 participants (43.1 %) scored between 5 and 10 points and 49 participants (19.9 %) scored >10 on the GDS. Regression analysis showed when body composition changes from normal (no sarcopenia and no obesity) to sarcopenia then GDS score increases by 5.5 points. When body composition changes from normal to sarcopenic obesity then GDS score increases by 4.4 points. No association was found between body composition change (normal to obese) and GDS score.

Conclusion: Sarcopenia and sarcopenic obesity were related to increased risk of depressive symptoms.

Introduction

Worldwide the number of cases of depression among different age groups is growing rapidly. In 2019 5.7% of adults older than 60 years had depression [1]. Hu and colleagues in 2022 published systematic review and meta-analysis of 48 studies found that the global prevalence of depression in older adults was 28.4% [2]. In elderly patients, severe psychological trauma, loss of a loved one, severe illness, loneliness and sedentary lifestyle can lead to depression that is often undiagnosed and untreated [3,4]

Sarcopenia is a geriatric syndrome, characterized by low muscle function and muscle mass [5]. Although sarcopenia has been discussed for quite a long time, ideas about sarcopenic obesity had begun only in the early 21st century [6]. Sarcopenia, obesity and sarcopenic obesity are closely linked to the ageing process and can result in negative outcomes, such as falls, frailty, disability and increased morality [7,8].

Pilati and colleagues conducted systematic review about the link of depressive symptoms and sarcopenic obesity but the results were found conflicted [9]. Some of the studies revealed that sarcopenic obesity was associated with depressive symptoms and other studies showed no significant association between depressive symptoms and different body composition types [10,11].

Obesity is another issue prevalent in older adults. In 2013 Global Burden of Disease Study revealed a worldwide increase in overweight (defined as body mass index ≥ 25kg/m^2) and obesity (body mass index ≥ 30kg/m^2) by 27.5% [12]. A study done in 10 European countries found increasing

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number of obese older adults from 17.5% to 19.2% in an 8 year period [13]. In older adults obesity is associated with increased risk of functional impairment, falls, cardiovascular diseases and worse emotional state [14–16].

The aim of this study was to examine the association between different body composition types and depressive symptoms in older adults.

Methods

For this cross-sectional study participants were enrolled from outpatient clinic in Vilnius, Lithuania. The inclusion criteria for study entry were age 65 years or older community dwelling men and women. The exclusion criteria were: moderate and severe cognitive impairment (MMSE score ≤21/30) [17]; acute illness; chronic diseases with advanced organ failure (heart, lung, liver, kidney, brain; malignancy; bed-sore). All participants provided written informed consent.

The criteria for diagnosis of sarcopenia, proposed in 2018 by the European Working Group on Sarcopenia in Older People (EWGSOP2) were used in this study [5]. Muscle strength was assessed by handgrip strength. A hydraulic dynamometer (JAMAR, Patterson Medical, UK) was used for this purpose, and the assessments were made in accordance with the Southampton protocol [18]. The cut-offs of 27 kg for men and 16 kg for women were used as the diagnostic criteria of sarcopenia. Muscle mass was measured by dual-energy X-ray absorptiometry (iDXA, GE Lunar, USA). A skeletal muscle mass index was calculated by dividing appendicular skeletal muscle mass by the subjects' height squared. The proposed cut-offs of 7 kg/m^2 for men and 6 kg/m^2 for women were used. Both devices – DXA machine and hand dynamometer – were calibrated according to the manufacturer's instructions. Physical performance was evaluated by gait speed. Participants were asked to walk 4 meters from a standing position at their usual pace. Gait speed assessment was a part of short physical performance battery (SPPB), which also included balance and 5-time chair stand tests. A total of 12 points can be earned. The cut-off of 8 points or less was used to diagnose severe sarcopenia.

Participants were classified as obese if the percentage of body fat measured by DXA was

Table 1. Descriptive characteristics of study participants (mean ± SD)
BMI – body mass index; WC – waist circumference; ASM/h2 - ratio of appendicular lean mass over height squared; SPPB – short physical performance battery; ADL – activities of daily living; IADL – instrumental activities of daily living; MNA – mini nutritional assessment; GDS – geriatric depression scale.

Characteristic	All subjects (n = 246)	Normal (n = 91)	Sarcopenia (n = 22)	Obesity (n = 115)	Sarcopenic obesity (n = 18)	p-value
Age, years	79.27 ± 6.48	78.67 ± 5.89	82.33 ± 6.07	78.84 ± 6.55	81.28 ± 8.29	0.047
Sex						
Men, n (%)	87 (35.4)	22 (24.2)	5 (22.7)	51 (44.3)	9 (50)	0.06
Women, n (%)	159 (64.6)	69 (75.8)	17 (77.3)	64 (55.7)	9 (50)	
Height, cm	165.78 ± 8.1	164.19 ± 8.42	167.81 ± 5.18	166.13 ± 8.17	169.05 ± 7.58	0.044
Weight, kg	68.63 ± 8.21	67.61 ± 8.01	67.91 ± 5.63	69.63 ± 9.07	68.22 ±5.2	0.346
BMI, kg/m^2	25.02 ± 2.99	25.12 ± 2.9	24.1 ± 1.57	25.28 ± 3.31	23.93 ± 2.13	0.141
WC, cm	91.37 ± 15.09	93.32 ± 15.8	88.56 ± 16.08	90.12 ± 14.64	92.94 ± 12.7	0.353
ASM/h^2, kg/m^2	6.54 ± 1.31	6.91 ± 1.26	5.1 ± 0.68	6.71 ± 1.23	5.29 ± 0.78	<0.001
Grip strength, kg	20.21 ± 6.97	21.53 ± 6.92	14.14 ± 3.66	20.83 ± 7.04	17 ± 5.22	<0.001
Gait speed, m/s	0.55 ± 0.19	0.6 ± 0.2	0.34 ± 0.1	0.55 ± 0.18	0.48 ± 0.15	<0.001
SPPB, score	7.28 ± 3.34	7.77 ± 2.95	6.23 ± 4.15	7.22 ± 3.29	6.44 ± 4.16	0.152
Number of comorbidities	2.18 ± 0.97	2 ± 0.94	3.09 ± 0.86	2.1 ± 0.93	2.56 ± 0.78	<0.001
Number of medications	3.76 ± 1.82	3.29 ± 1.66	5.05 ± 1.64	3.67 ± 1.85	5.11 ± 1.18	<0.001
ADL, score	4.97 ± 0.87	5.11 ± 0.82	4.27 ± 0.76	5.07 ± 0.88	4.5 ± 0.7	<0.001
IADL, score	6.89 ± 1.49	7.34 ± 1.06	6.14 ± 1.28	6.9 ± 1.55	5.44 ± 1.94	<0.001
MNA, score	16.94 ± 4.47	17.14 ± 4.66	15.41 ± 4.15	16.73 ± 4.34	19.14 ± 4.1	0.061
GDS, score	6.65 ± 3.14	5.86 ± 2.68	11.36 ± 1.7	5.8 ± 2.7	10.28 ± 0.89	<0.001

Table 2. Linear regression for the association between body composition and depressive symptoms
Reference category: normal (no sarcopenia/ no obesity).

	B coefficient	95% Confidence interval	p-value
Sarcopenia	5.506	(4.31 – 6.69)	<0.001
Obesity	-0.057	(-0.75 – 0.64)	0.873
Sarcopenic obesity	4.421	(3.13 – 5.71)	<0.001

greater than 27% for men and 38% for women [19]. Sarcopenic obesity was diagnosed if both sarcopenia and obesity were present. Based on body composition participants were sorted into four groups: normal (no sarcopenia and no obesity), sarcopenia, obesity, sarcopenic obesity.

Depressive symptoms were examined using the 15-item Geriatric Depression Scale (GDS), each item was scored from 0 to 1 point and the total score ≥5 was used to define the presence of depressive symptoms [20].

Functional status was evaluated using Katz Activities of Daily Living (ADL) and Lawton Instrumental Activities of Daily Living (IADL) scales [21,22]. Nutrition status was assessed by mini nutrition assessment (MNA) questionnaire [23]. The number of concomitant illnesses and medications were collected from medical records. All subjects were measured for height, weight and waist circumference. Body mass index (BMI) was calculated by dividing weight by height squared.

Statistical analysis was performed using IBM SPSS Statistics Windows software version 18 (IBM, New York). Normality of data was examined by Shapiro-Wilk test. Continuous variables were expressed as mean and standard deviation. Nominal data was reported as frequencies (number, percentage). Differences between body composition groups were compared using Analysis of Variance (ANOVA) with post-hoc tests. Linear regression analysis was used to compare body composition changes and depressive symptoms. Level of significance (p-value) of <0.05 was considered as statistically significant.

Results

We asked 286 people who previously participated in other of our studies to participate in this study, 28 declined. Five participants had acute illness and 7 had advanced chronic disease so they were excluded. Later the sample was comprised by 246 study participants: 87 men (35.4%) and 159 women (64.6%). Basic descriptive characteristics of study population are shown in Table 1.

The largest group of participants had obesity (46.7 %). The second group did not have disorder of body composition (37 %). Third group - people with sarcopenia (8.9 %). Participants with sarcopenic obesity comprised the smallest group of 7.3 %.

Out of all participants 91 (37 %) scored lower that 5 on the GDS. A hundred and six participants (43.1 %) scored between 5 and 10 on the GDS and around a fifth of all participants scored 10 or more points on the GDS scale.

The results of linear regression analysis between body composition and depressive symptoms can be seen in Table 2.

Results show when body composition changes from normal (no sarcopenia/ no obesity) to sarcopenic, then GDS score increases by 5.5 points. And if body composition changes from normal to sarcopenic obesity then GDS score increases by 4.4 points. No association was found between body composition change (normal to obese) and GDS score.

Discussion

In this cross-sectional study of 246 community-dwelling older people, we discovered that participants with sarcopenic obesity and sarcopenia had significantly increased risk of depressive symptoms.

Ishii and colleagues in their study also showed that sarcopenic obesity was positively associated with more depressive symptoms but in their study neither sarcopenia or obesity alone was not associated with depressive symptoms [24]. Also, they analyzed this association by age groups and their findings suggest that sarcopenic obesity increases the risk of depressive symptoms in a synergistic manner, especially in people 65 to 74 years old. This study research concept was similar to ours, but the assessments of sarcopenia and depressive symptoms were different. For muscle mass assessment they used bioimpedance analysis while we used DXA. They also used different cut off values for handgrip strength and different method to measure usual gait speed. To assess depressive symptoms, they as well used GDS. However, the cut off for depressive symptoms was score of ≥6 compared to our ≥5 points. The variety in methodology may have led for the differences in results.

On the other hand, Byeon and colleagues showed no significant associations between sarcopenia and the prevalence of depression or depressive symptoms [25]. In their study sarcopenia, obesity and depression were diagnosed using different methods. Obesity was diagnosed using BMI and we used percentage of fat mass measured by DXA. Sarcopenia was diagnosed by dividing appendicular skeletal muscle mass from subjects' weight while we for muscle mass assessment divided appendicular skeletal muscle mass by the subjects' height squared. In the depression group they included participants who were diagnosed with clinical depression, in the depressed symptom group where patients who responded positive to the question "In the past year, have you felt sadness or despair continuously for two or more weeks that was severe enough to interfere with daily life?". Our study used geriatric depression scale for the assessment of depressive symptoms. Furthermore, the difference between studies is that Beyon and colleagues analyzed results from people as young as 20 years. We only included older adults. To sum up, the age of participants and different measurements could be the main reasons for the

different findings. Pilati and colleagues in 2022 published systematic review about sarcopenic obesity and depressive symptoms [9]. This review included 7 studies and found limited evidence that sarcopenic obesity increases the risk of depressive symptoms. Although due to variability in assessment methods used and outcomes measured the results were heterogeneous.

In conclusion, we demonstrated that depressive symptoms were positively associated with sarcopenic obesity and sarcopenia in community dwelling older adults. Because there is a variability of evaluation techniques and methods, the results are heterogeneous. Future studies are needed in order to identify the mechanisms and to prevent the common occurrence of sarcopenia, sarcopenic obesity and depressive symptoms.

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SENYVO AMŽIAUS ASMENŲ SKIRTINGŲ KŪNO SUDĖTIES TIPŲ IR DEPRESIŠKUMO SIMPTOMŲ RYŠYS

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Raktažodžiai: sarkopenija, nutukimas, sarkopeninis nutukimas, depresiškumo simptomai.

Santrauka

Tyrimo tikslas. Išanalizuoti senyvo amžiaus asmenų skirtingų kūno sudėties tipų ir depresiškumo simptomų ryšį.

Metodai. Vienmomentinis retrospektyvinis skerspjūvio tyrimas buvo atliktas Vilniaus mieste, įtraukiant bendruomenėje gyvenančius ≥65 metų amžiaus vyrus ir moteris. Neįtraukimo į tyrimą kriterijai buvo vidutinis ir sunkus pažintinių funkcijų sutrikimas, ūminės ligos ir lėtinės ligos su ūminiu organų funkcijos nepakankamumu. Šiame tyrime taikyti sarkopenijos diagnostikos kriterijai, 2018 m. pasiūlyti Europos senyvų žmonių sarkopenijos darbo grupės. Viršutinių galūnių raumenų jėga buvo vertinama išmatavus sugriebimo jėgą. Raumenų masė buvo matuojama naudojant dvisrautės radioabsorbciometrijos metodą (iDXA, GE Lunar, JAV). Fiziniui pajėgumui vertinti taikytas trumpasis fizinės funkcijos testų rinkinys. Nutukimas nustatytas matuojant kūno riebalų procentinį kiekį DXA metodu. Sarkopeninis nutukimas apibrėžtas esant sarkopenijai kartu su nutukimu. Depresiškumo simptomų pasireiškimas buvo vertintas taikant 15 punktų geriatrinę depresijos skalę (GDS).

Rezultatai. Išanalizuoti 246 tiriamųjų: 87 vyrų (35,4 proc.) ir 159 moterų (64,6 proc.), vyresnių nei 65 metų, duomenys. Pagal kūno sudėties tipą tiriamieji buvo suskirstyti į keturias grupes: nutukimo (46,7 %), normalus kūno sudėjimo (37 %), sarkopenijos (8,9 %) ir sarkopeninio nutukimo (7,3 %). Iš visų tiriamųjų: 91 (37 %) surinko <5 balus, 106 (43,1 %) surinko nuo 5 iki 10 balų ir 49(19,9 %) surinko >10 balų, vertinant GDS. Atlikta regresinė analizė parodė, kad jei kūno sudėtis keičiasi iš normalios (be sarkopenijos ir nutukimo) į sarkopeninę, GDS balai padidėja 5,5 balo. Kai kūno sudėtis keičiasi iš normalios į sarkopeninio nutukimo, GDS balai padidėja 4,4 balo. Ryšys tarp kūno sudėties pokyčių (iš normalios į nutukimo) ir GDS balų nenustatytas.

Išvados. Sarkopenija ir sarkopeninis nutukimas susiję su didesne senyvo amžiaus asmenų depresiškumo rizika.

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