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EATING HABITS OF PATIENTS WITH SARCOPENIC OBESITY

Dženita Salihefendić[1*]

[1]Polyclinic "Medicus A", Mustafe Rešidbegovića 2, 75320 Gračanica, Bosnia and Herzegovina

[*]e-mail: dzenitasalihefendic@gmail.com

Abstract

In the aging process, physiological changes weaken the structure of tissues, organs, and organ systems. This year, the World Health Organization (WHO) declared a decade of healthy aging. According to their data from 2016, 650 million people over 18 were obese. An alarming prevalence also occurs in vulnerable groups such as the elderly. Prevention of sarcopenia and obesity, along with its complications, are among the most crucial health actions in this decade of healthy aging. Adequate nutrition and physical activity are essential preventive measures. Assessment of eating habits and physical activity enables the introduction of specific nutritional recommendations for people with sarcopenic obesity. The work aimed to evaluate the characteristics of eating and lifestyle habits in patients with sarcopenic obesity.

This study included 30 subjects of both sexes, aged 65 to 75, who were patients in Polyclinic Medicus A, Gračanica. The inclusion criteria for entering the study were proven obesity and sarcopenia. Skeletal muscle mass index (SMI) was used to assess the presence of sarcopenia, and obesity was proven using body mass index (BMI). Obese patients whose SMI was within normal limits were in the control group. Data on dietary habits was collected using an eating habits questionnaire. The difference between the groups is analyzed using the chi-square Mann-Whitney U test. The analysis is performed using the statistical software MedCalc v12.3.

Patients with sarcopenic obesity were statistically significantly ($p < 0.05$) less physically active, more prone to insomnia, and consumed less fruit and vegetables and more carbohydrate foods than the control group. There are significant differences in the eating and lifestyle habits of the experimental and control groups. Nutritional interventions include increased protein intake (> 1.2 g/kg body weight/day) and following the Mediterranean diet consisting of fresh fruit and vegetables, fatty fish, and nuts.

Grape seed extract, Marat root, vitamin D, and probiotics may be helpful in the treatment of sarcopenia. It is also recommended to increase physical activity, especially resistance training.

***Key words**: Obesity, Sarcopenia, Nutrition interventions, Prevention, Healthy ageing.*

1. Introduction

Healthy aging is "the process of developing and maintaining the functional ability that enables wellbeing in older age". The World Health Organisation and the United Nations started an initiative to optimize older people's functional and mental abilities. The global plan was named "UN Decade of Healthy Ageing (2021 - 2030)" [1].

Two primary pathological conditions significantly threaten healthy aging: an increase in fat tissue (overweight and obesity) and a decrease in muscle mass and function (sarcopenia). Both conditions synergistically threaten the general state of the human body, increasing the incidence of chronic non-communicable diseases and severe insufficiency of the locomotor apparatus [2].

Sarcopenia is defined by the European Working Group on Sarcopenia in the Elderly (EWGSOP) as low muscle mass, low strength muscle mass, and/or poor physical performance. The recently updated consensus statement of the European Working Group on Sarcopenia in the Elderly (EWGSOP2) defines sarcopenia as "muscle disease (muscle weakness) resulting from degenerative changes in muscle tissue that occur during life". Sarcopenia is common among

older adults but can also occur earlier in life. Muscle strength loss is a key characteristic of sarcopenia [3].

With normal aging, the quality of muscle fibers slowly deteriorates, and maximal strength, shortening speed, and elasticity gradually decline. Muscle fiber weakness can be explained by the interaction of several age-related changes, including the loss of anabolic stimuli due to decreased concentrations of testosterone and other anabolic hormones and age-related subclinical inflammatory changes. Physical activity can partially reverse this last aspect [4].

Sarcopenia, the age-related decline in muscle mass and function, is one of the most important health problems in the elderly, with a high rate of adverse outcomes. However, few studies have investigated the prevalence of sarcopenia worldwide, and the results have been inconsistent. The current systematic review and meta-analysis study was conducted to estimate the overall prevalence of sarcopenia in both sexes in different regions of the world [5].

The prevalence of sarcopenia is increasing as a result of the aging of the population worldwide. The characteristics of the studied population (such as age, sex, race, and differences in body composition in ethnic groups) and the methodology used to estimate the parameters of sarcopenia cause significant differences in the rate of this disease. In the general population, the prevalence of sarcopenia, according to different studies, ranges from 8.4 to 27.6% [5, 6]. In one study, 61.3% of underweight participants, 42.9% of normal weight participants, 35.2% of overweight participants, and 26.8% of obese participants had possible sarcopenia which shows that body mass index - BMI in combination with sarcopenia measure is a better indicator of frailty and mortality [7].

Sarcopenia and obesity have similar etiological factors, primarily poor nutrition and inactivity. Physical activity as a primary condition for losing increased body mass is significantly limited in people with increased body mass. It is necessary to emphasize one pathological condition in which both obesity and sarcopenia appear at the same time, the so-called sarcopenic obesity. For a long time, no attention has been paid to sarcopenic obesity. Neither the definition nor the method of diagnosis is clear, nor is the general prevalence of the disease in the world [2]. The European Society for Clinical Nutrition and Metabolism (ESPEN) and the European Association for the Study of Obesity (EASO) have jointly brought a consensus statement on the definition and diagnostic criteria of sarcopenic obesity on methods of prevention and treatment. According to the statement, sarcopenic obesity is defined as the "co-existence of obesity and sarcopenia". A decision algorithm was proposed to screen, diagnose, and treat patients with sarcopenic obesity easily. Screening is based on a BMI ≥ 30 and/or waist-hip ratio ≥ 0.90 cm in men and ≥ 0.85 cm in women, as well as on the clinical picture and risk factors. The European working group on sarcopenia in older people 2 (EWGSOP2) determined the algorithm for the diagnosis of sarcopenia, which is "find-assess-confirm-severity" (FACS).

The diagnosis is based on the following tests: strength, assistance with walking, rising from a chair, climbing stairs, and falls (SARC-F) questionnaire. For assessment of sarcopenia, handgrip strength, and chair stand tests are used. Sarcopenia is confirmed by measuring skeletal muscle mass (SMM) via magnetic resonance imaging (MRI), computed tomography (CT), dual-energy X-ray absorptiometry (DEXA), or bioelectrical impedance analysis (BIA).

The severity of sarcopenia is ranked using a gait speed test, short physical performance battery (SPPB), timed-up and go test (TUG), and the 400-meter walk test [8].

The previous lack of this definition led to a lack of diagnostic criteria and the expected development of preventive and therapeutic strategies.

ESPEN and EASO recommend introducing these diagnostic criteria into clinical practice to prepare appropriate nutritional interventions and physical activity for both conditions simultaneously. Many studies have shown that these recommendations significantly positively affect the prevention of sarcopenic obesity, which also means preventing chronic non-communicable diseases that accompany it. Recommendations on lifestyle and diet modification are significant [9].

This work aims to assess the frequency of co-occurrence of obesity and sarcopenia in family medicine practice. Since sarcopenia and obesity have similar etiological factors, the work aimed to evaluate the characteristics of eating and lifestyle habits in patients with sarcopenic obesity.

2. Materials and Methods

Patients were included in the study with voluntary consent. The examination was conducted in the family medicine practice "Medicus A" in Gračanica. Before the start of the research, consent was sought from the ethics committee and the practice owner.

Data was collected using the InBody 770 medical scale, which uses two frequencies of bioelectrical impedance to obtain skeletal and body mass index values.

The skeletal muscle index (SMI) is calculated by dividing the appendicular muscle mass by the height (m^2). Sarcopenia is defined if the lean mass index in men is SMI < 7.4 kg/m^2 and SMI < 5.6 kg/m^2 in women.

The questionnaire assessed eating and lifestyle habits in patients with sarcopenia. The questionnaire consisted of 32 questions and was assembled into four different groups: stress (3 items), physical activity (1 item), body weight fluctuation, eating habits, food and beverage consumption (24 items), and foods that should be consumed less (4 items). The difference between the subject groups is calculated using the chi-square test, which shows a significant level of 95%. The Mann-Whitney U test was used to test the differences between the two samples. This corresponds to the t-test for independent samples and is applied in situations of smaller samples. The analysis is performed using the statistical software for medical sciences MedCalc v12.3.

3. Results and Discussion

3.1 Results

This study included 30 subjects of both sexes, aged 65 to 75. The inclusion criteria for entering the study was proven sarcopenia.

There were 8 (53%) women and 7 (47%) men in the obese group and 9 (60%) women and 6 (40%) men in the group with average body weight (Table 1).

Table 1. Demographic data

Group	Woman	Men	Total
Experimental	8 (53%)	7 (47%)	15
Control	9 (60%)	6 (40%)	15
		p = .602	

The average BMI in obese patients was 31.94 kg/m^2, and in patients with normal weight, 22.97 kg/m^2 (Table 2).

Table 2. The average value of BMI in experimental and control groups

	Subjects	N	Average value
BMI	Normal weight	15	22.97
	Obese	15	31.94

There was no statistical significance in average values of SMI between the experimental and control groups (p = 0.9) (Table 3).

Based on the numerical results, the sample in this research is balanced in terms of relevant variables (Tables 1, 2, and 3).

In the experimental group average SMI for women was 5.36 and for men 7.03. In the control group average SMI for women was 5.25, and for men, 6.27 (Figure 1).

Figure 1. Average SMI based on gender in obese patients with sarcopenic obesity and patients with normal weight

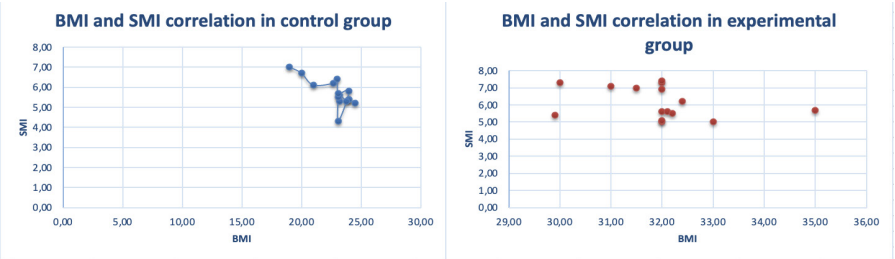

Figure 2. Correlation between BMI and SMI in experimental and control group

Table 3. Differences in SMI depending on BMI category

	Subjects	N	Average value	Mann - Whitney U	p-value
SMI	Obese	15	6.14	p = 0.74	0.49
	Normal weight	15	5.73		

Skeletal mass index and body mass index appear to be weakly negatively correlated in both the experimental group (r = -0.34) and the control group (r = -0.29) (Figure 2).

Questions related to the patient's lifestyle and eating behavior are presented in Table 4.

There is a statistically significant difference in the answers to questions regarding lifestyle and eating habits between patients of the experimental and control groups. Sleep disturbances occur more often in the experimental group (p = 0.001). 86% of patients with healthy weight and 93% of obese patients are occasionally/daily under stress. Physical activity, as an essential factor in the development of sarcopenia and obesity, was significantly reduced in the experimental group (0.0001). Patients with sarcopenic obesity spend most of their time sitting and rarely follow recommendations for lifestyle changes concerning physical activity and diet. Fluctuation in body weight is evident in both groups admitting a higher incidence in obese patients (p = 0.04).

A high number of patients from both groups prepare food by either frying or grilling (p = 0.77). Patients in both groups practice unhealthy eating habits and do not apply nutritional guidelines or recommendations for mindful eating (p = 0.5). Patients in both groups also do not apply the recommendations to consume five servings of fruit/per day and do not consume a sufficient amount of vegetables, which is essential for preventing non-communicable diseases. Sarcopenic patients with normal weight statistically significantly consume more vegetables (p = 0.02). Obese people eat white bread (p = 0.0001), while sarcopenic patients with healthy body weight consume more whole grains (0.0001). Dairy consumption is more frequent in patients with normal body weight (0.04). Red meat is statistically significantly consumed by patients with sarcopenic obesity (p = 0.0001), while those with a healthy weight consumed red meat according to the recommended guidelines (Once a week). Patients with a healthy weight eat fish and poultry more often (p = 0.0001). Smoking is a common habit among both groups of patients, while alcohol consumption is more common among those with a normal weight (0.01). Sweetened foods such as cakes, cookies, and pie are consumed by both groups, although more often in patients with sarcopenic obesity. Sweetened carbonated or non-carbonated drinks, including energy drinks, are consumed by patients of both groups.

Table 4. Patients' responses to questions related to their lifestyle and eating behavior

			Normal weight		Obese		P Value
Questions	**Answers**	**Total N=**	**N=**	%	**N=**	**%**	
How physically active are you during the day?	I spend most of the day sit	9	0	0	9	60	
	I walk up to half an hour a d	10	6	40	4	27	
	I walk more than one hour	9	8	35	1	7	
	I do sports recreationally	2	1	7	1	7	
	I do sports professionally	0	0	0	0	0	0.0001
How often do you eat fruit?	Rarely	4	0	0	4	27	
	2-3 portions/day	25	14	93	11	73	
	5 or more portions/day	1	1	7	0	0	0.004
How often do you eat vegetables?	Rarely	6	1	7	5	33	
	Once a week	15	8	53	7	47	
	More than twice a week	9	6	40	3	20	0.02
How much bread do you eat on a daily basis?	More than 8 slices	5	0	0	5	33	
	3-5 slices	11	4	27	7	47	
	2 of less slices	14	11	73	3	20	0.0001
How often do you eat whole grains?	Once a month	16	4	27	12	80	
	Once a week	10	8	53	2	13	
	Every day	4	3	20	1	7	0.0001
Do you consume milk and milk products on a daily basis	Yes	25	14	93	11	73	
	No	5	1	7	4	27	0.04
How often do you eat fish?	Once a month	14	2	13	12	80	
	Once a week	8	5	33	3	20	
	2-3 times a week	8	8	53	0	0	0.0001
How often do you eat red meat?	Every day	11	1	7	10	67	
	2-3 times a week	7	5	20	4	27	
	Once a week	12	11	73	1	7	0.0001
How often do you eat sweets?	Every day	14	4	27	10	67	
	2-3 times a week	12	7	47	5	33	
	Once a week or never	4	4	27	0	0	0.001

3.2 Discussion

Sarcopenia is defined by the European Working Group on Sarcopenia in the Elderly (EWGSOP) as "muscle disease (muscle weakness) resulting from degenerative changes in muscle tissue that occur during life". Sarcopenia is common among older adults but can also occur earlier in life. Muscle strength loss is a key characteristic of sarcopenia [3]. Epidemiological studies demonstrate a significant increase in the incidence of sarcopenia, particularly among the elderly [5, 6]. As the global population ages, the prevalence of sarcopenia is remarkably high, with aging alone being associated with its rise [4, 6]. Sarcopenia is commonly regarded as a disease of malnutrition; however, there is substantial evidence indicating a high frequency of sarcopenia even among individuals with pathological obesity [5, 6, 7, 9, and 10]. Among the obese, a significant proportion exhibit evidence of sarcopenia. This highlights the complexity of sarcopenia and its association with diverse physiological conditions beyond malnutrition, warranting further investigation and clinical attention.

There are established criteria for defining and diagnosing sarcopenic obesity [3, 9]. As our understanding evolves, it's increasingly evident that sarcopenic obesity represents a complex interplay between muscle mass depletion and adiposity, requiring nuanced diagnostic approaches. This underscores the necessity for precise clinical assessment and tailored interventions to address this multifaceted condition effectively.

In clinical practice, EWGSOP2 suggests employing multiple methods to ascertain evidence of reduced muscle quantity or quality. In alignment with evolving diagnostic standards, this study integrates criteria for sarcopenic obesity assessment, incorporating bioelectrical impedance analysis alongside Skeletal Mass Index (SMI) measurement. Beyond conventional methods, such as dual-energy X-ray absorptiometry (DXA), emphasis is placed on bioelectrical impedance analysis in clinical settings, ensuring a comprehensive evaluation of muscle health [3, 11].

Sarcopenia and obesity represent two pandemics confronting society today [4, 6, and 10]. It is imperative to emphasize the necessity for increased research efforts and greater focus on understanding and addressing these intertwined conditions. Both sarcopenia and obesity present multifaceted challenges, influenced by a myriad of factors including lifestyle habits, nutrition, genetics, inactivity, and age-related changes [2, 10, and 12]. As such, there is a pressing need for comprehensive investigation and targeted interventions to combat the rising prevalence of sarcopenia and obesity [4, 6]. Understanding the intricate relationship between these conditions is crucial for developing effective strategies to promote healthy aging and mitigate their adverse health effects on individuals and populations alike.

In this study, the focus primarily revolves around identifying and examining risk factors associated with sarcopenic obesity. Analysis reveals that patients with this condition exhibit heightened risk factors, including poorer sleep quality, reduced physical activity, weight fluctuations, and lower protein intake but higher consumption of carbohydrate-rich foods. Moreover, all sarcopenic patients indulged in sweetened foods with this trend being more prevalent among the obese.

Furthermore, it's noteworthy that neither the healthy weight nor the obese group adhered to nutritional or intuitive eating guidelines during the questionnaire completion, nor did they consume adequate amounts of fruits and vegetables. Food preparation practices were suboptimal in both groups. There was a high incidence of smoking and alcohol use.

These findings underscore the critical importance of addressing these identified risk factors in the prevention and management of sarcopenic obesity.

The inconclusive evidence regarding the impact of specific foods on sarcopenia development highlights the intricate interplay between dietary factors and muscle health [13]. Nonetheless, emerging research underscores the detrimental effects of highly refined foods and simple sugars, which can trigger low-grade inflammation and anabolic resistance - key pathophysiological mechanisms implicated in sarcopenia [13].

Studies suggest that people with unregulated type 2 diabetes and blood glucose fluctuations may be at heightened risk of muscle mass and strength loss, underscoring the relevance of metabolic factors in sarcopenia development. High-calorie and high-carbohydrate diets often lack sufficient protein—a crucial nutrient for muscle building [13].

The recommended first-line treatment for sarcopenia, regardless of weight status, emphasizes the crucial role of physical activity [14 - 16]. Moreover, adults with low skeletal muscle mass and strength are at a significantly higher risk of obesity [9]. This finding resonates with the results of the questionnaire of this study, revealing low physical activity in both subject groups. The decrease in energy expenditure with age, coupled with fat-free mass-related lower basal metabolic rate, contributes to sarcopenia and obesity risk. Intramuscular fat accumulation exacerbates anabolic resistance, further predisposing individuals to sarcopenia.

In addition to increased physical activity, addressing proper nutrition and specific supplements plays a crucial role in managing sarcopenia, particularly for people with sarcopenic obesity. While the study did not delve deeply into recommendations, the importance of these interventions cannot be understated. Boosting protein intake, supplementing with essential nutrients like calcium, magnesium, vitamin D, selenium, and omega-3 fatty acids, and maintaining a healthy gut microbiota through symbiotics and fermented products are highlighted as beneficial strategies [5, 17]. Herbal supplements such as Marat root extract, grape seed extract, and curcumin have also shown promise in sarcopenia treatment [18]. Intermittent fasting and adherence to the Mediterranean diet, which emphasize the consumption of fruits, vegetables, nuts, fish, and poultry while limiting processed foods and sugary beverages, are praised for their myo-protective effects and may serve as valuable dietary approaches in managing sarcopenia [2, 14].

There were some limitations to this research. The study was conducted with a relatively small sample size of only 60 patients. While efforts were made to ensure representativeness within this sample, the findings may not fully capture the diversity of the broader population. Methodologically, reliance on self-reported data and the likelihood of recall bias may have influenced the accuracy of reported lifestyle and eating habits.

Additionally, the use of questionnaires to assess lifestyle and eating habits may be susceptible to social desirability bias. Questionnaires assessing lifestyle and eating habits may not capture the full complexity of these behaviors. Participants may overlook certain aspects or provide oversimplified responses, leading to an incomplete understanding of their habits. Despite efforts to control for confounding variables, such as age, gender, and medical history, there may be other unmeasured factors that influence the observed associations between eating habits and health outcomes.

The study offers valuable insights into the relationship between lifestyle and eating habits among individuals with sarcopenic obesity, shedding light on a relatively understudied area. Despite its limitations, such as a small sample size and reliance on self-reported data, the research provides a comprehensive analysis within a single institution setting. By employing rigorous methodology and controlling for potential confounding variables, the study contributes to our understanding of factors influencing sarcopenic obesity. Additionally, the findings pave the way for further research to explore interventions aimed at improving dietary behaviors and overall health outcomes in this population.

4. Conclusions

- The role of nutrition is certainly important in the etiopathogenesis of sarcopenic obesity.
- Unhealthy eating habits can lead to malnutrition or obesity, and the reduced intake of protein food is especially emphasized. According to the results of this study, patients with sarcopenia with or without obesity have similar eating habits and lifestyles.
- There is a statistically significant difference in the answers to questions regarding lifestyle and eating habits between patients of the experimental and control groups. Patients with sarcopenic obesity had a poorer night's sleep, were less physically active, fluctuated weight, enjoyed eating, and ate less protein but more carbohydrate-rich food. Both groups consume sweetened foods such as cakes, cookies, and pie, although more often in the obese. Neither group adhered to nutritional guides or guides on intuitive eating while completing the questionnaire, nor did they consume sufficient amounts of fruits and vegetables. Food preparation in both groups was inadequate.
-To combat sarcopenic obesity and all its consequences, nutritional and lifestyle interventions must be made. The first treatment choice should be increasing physical activity by combining endurance and resistance training. The diet should be filled with fresh, seasonal fruits and vegetables, nuts and grains, and fatty fish. To prevent muscle wasting and frailty, increasing protein intake (> 1.2 g/kg/day) is recommended. Depending on the patient's health status and mental capabilities, certain dietary supplements (calcium, magnesium, vitamin D, selenium, and omega-3) can be added. Herbal supplements might also be of use (Marat root and gape seed extract), as well as green tea, ginger, and curcumin.
- Following the Mediterranean diet and the mentioned nutritional interventions should be a lifestyle, not just a short-term diet plan. It is necessary to put the practice of conscious eating in the foreground, where the focus is on using all the senses. Intuitive nutrition restores the connection between the brain and the small intestine (gut-brain axis), reduces the amount of food taken, and thus leads to weight loss.
- Educating patients about mindful eating and complete lifestyle changes is essential in the prevention and treatment of sarcopenic obesity.

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