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Investigation of the Effects of Obesity on Physical Function and Quality of Life in Elderly Women

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ABSTRACT

Objective: The aim of this study was to determine the effects of obesity on physical function and quality of life in elderly women.

Methods: The sample of the study consisted of 90 elderly women living in Isparta provinence. The subjects included in the study were divided into 3 groups according to their body mass index (Group I: normal, Group II: overweight, Group III: obese).The physical activity scale for the elderly, short physical performance test battery, SF-12 quality of life questionnaire, timed up and go test and a scale that questions the difficulties of individuals experience in daily living activities were used as the evaluation methods.

Results: Physical Activity Scale for the Elderly and short physical performance test battery scores in group I were higher than that of the other groups, and group II were higher than group III; while timed up and go test scores were vice versa ($p<0.05$). Functional limitation scores were higher in Group III than Groups I and II ($p<0.05$). Body mass index showed a strong negative correlation with physical performance (r: −0.591), moderate negative correlation with the Physical Activity Scale for Elderly scores (r: −0.427) and moderate positive correlation with the timed up and go test value (r: 0.418) and functional limitation (r: 0.335) ($p<0.01$).

Conclusion: In elderly women; physical activity, functional mobility levels, physical performance decrease with increasing body mass index and functional limitation level increases in parallel with the body mass index. In addition, it was determined that the quality of life scores did not differ according to the body mass index.

Keywords: Elderly Women, Functional Limitation, Obesity, Physical Function, Quality of Life

1. INTRODUCTION

Decreasing birth rates, advances in health and technology and improvements in the treatment of chronic diseases have increased the average life expectancy in today's world as well as the pace of ageing population and rate of the elderly population (1). This increase has introduced the concept of 'active ageing'. Active ageing aims to improve the quality of life of the elderly in society and enable them to maintain a more active and social life during this period and perform daily activities independently (1,2).

Ageing brings about changes in the body composition, such as a progressive increase in the percentage of body fat mass, increasing the risk of developing obesity in the elderly population. This age-related increase in the fat mass is particularly higher in women than in men. These age-related changes lead to cardio metabolic complications and functional limitations in the elderly as well as impairment of the quality of life (2).

The decline in the physical activity levels and resting metabolic rate with increasing age causes a decrease in the total energy expenditure, resulting in a positive energy balance. Positive energy balance has an important role in increasing lean body mass and results in increased obesity rates in the elderly population. Reduced physical activity owing to inadequate engagement of elderly obese individuals in physical activities causes a decrease in physical function levels, functional mobility and independence in daily life activities (3). When the literature was reviewed, it was observed that elderly individuals who have low body mass index (BMI) values and adequate physical activity levels, live healthier and are at a lower risk of chronic diseases, and those with high physical performance have a higher scores of life quality (4).

According to the prevalence of the obesity in older adults, higher rates are observed in women. Furthermore, physical function levels in women are reported to be lower than

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those in men (4). Therefore, evaluation of the relationships among obesity, physical function and quality of life in elderly women becomes more important. In addition, it is important to determine the effect of obesity on physical function and quality of life, since one of the key factors of healthy aging is to keep physical function levels high. In light of this information, the aim of this study was to investigate the effect of obesity on the physical function and quality of life in elderly women.

2. METHODS

This study, with the aim of examining the effect of obesity on the physical function and quality of life in elderly women, was a descriptive study carried out in a cross sectional manner and conducted with 90 elderly women aged between 65 and 85 years in November 2017 and May 2018.

2.1. Study Population

The population of the study was determined as female individuals over the age of 65 years, who were residing in Davraz district of Isparta province. The study sample was determined using the snowball sampling method. In total, 112 elderly women over 65 years of age were enrolled in the study by this method. Eighteen people withdrew from the study on their own volition after being informed in detail about the study, whereas four people were withdrawn from the study because they felt unwell while performing the study procedures, and the study was completed with a total of 90 elderly women.

Age of ≥65 years, voluntariness to participate in the study, being independently mobile, absence of serious systemic disease, absence of serious hearing and visual loss, Geriatric Depression Scale Short Form (GDS-SF) score of ≥5 and Mini Mental State Test score of ≥24 points constituted the inclusion criteria. Individuals who were in the process of recovery from an acute disease, those who had serious diseases that would pose a contraindication for physical activity and those who experienced change in their health status while performing study procedures were excluded from the study.

A sociodemographic data form that was created by researchers based on literature review was initially administered to the participants, and then BMI was calculated by dividing body weight by the square of height. Participants were divided into the following three groups: normal (Group I) individuals with BMI between 20 kg/m² and 24.9 kg/m², overweight (Group II) individuals with BMI between 25.0 kg/m² and 29.9 kg/m² and obese (Group III) individuals with BMI of >30 kg/m² (5).

2.2. Physical Performance

The physical performance level of the participants was evaluated by short physical performance test battery (SPPB), the reliability and validity of which were proven in the elderly population (6). The test comprised three parts: gait speed, standing balance and chair stand. In standing balance section, participants were asked to maintain their feet together in a standing position as well as in tandem and semi-tandem positions for 10 seconds. In gait speed section of the test, participants were asked to walk 4 metres at the usual pace. In the chair stand section, participants were asked to quickly stand up five times from a backed chair of standard height without using their hands, while folding their arms on their chests. All three physical performance measures are scored between 0 and 4 according to the duration of the activity. The scores of the three tests are added to give a total score between 0 (minimum) and 12 (maximum). High scores indicated high levels of physical performance (6).

2.3. Physical Activity

The elderly individuals' physical activity levels were evaluated with the Physical Activity Scale for Elderly (PASE), which was developed to determine the levels of work, entertainment and physical activity of elderly individuals, and the Turkish reliability and validity study of this test has been performed (7). PASE is a scale evaluating physical activities that people have done in the last 7 days in a multidimensional manner. The PASE score is calculated by multiplying activity frequencies and activity weights. High scores indicate high physical activity levels (7).

2.4. Quality of Life

The level of the quality of life of the participants was evaluated by SF-12, which was created by shortening and simplifying the SF-36 questionnaire, allowing the evaluation of physical and mental status separately. The total physical health score consisted of physical functionality, general health, bodily pain and role-physical sub-dimensions; mental health total score is obtained from mental health, social functionality, role-emotional, and energy sub-dimensions. A score of 0–100 can be obtained from both the physical and mental health, high scores indicate better health status (8).

2.5. Functional Mobility

The functional mobility of the participants was evaluated with Timed Up and Go Test (TUG). TUG is a test used frequently to evaluate older adults' functional mobility (9). During the test, participants were asked to stand up from a chair without using the arms of the chair, walk 3 meters and turn back without touching anything and walk back to and sit back on the chair. Participants were asked to wear the shoes they regularly wear to walk at a normal pace, and walking aids were allowed. The time elapsed between the participants getting up from the chair and sitting back was recorded in second.

2.6. Functional Limitation

The functional limitation level of the participants was determined with a seven-item scale inquiring the difficulties faced in certain daily life activities, such as climbing or going down 15 stairs without pausing, walking outside the house

for 15 minutes, undressing, getting up from and sitting on a chair, cutting your own toenails, taking a bath or a shower and using a private vehicle or public transportation. On this scale, activities are scored between 0 and 4 according to the degree of difficulty experienced in daily life activities, and high scores indicate advanced functional limitation levels (10).

2.7. Cognitive Evaluation

The cognitive level of the subjects was determined using the Standardized Mini Mental Test (SMMT). In total, 30 points can be obtained in this test: 0–9 points indicate severe cognitive impairment, 10–19 points indicate moderate cognitive disorder, 20–23 points indicate mild cognitive disorder and 24–30 points indicate no cognitive impairment (11).

2.8. Depression

GDS short form was used to evaluate the depression levels of the participants. GDS-SF short form is a short and easily applicable form of GDS, consisting of 15 questions inquiring the patient's mood. Answers are given based on the feelings in the last week with yes-no questions. A score of ≥5 points indicates the presence of depression (12).

2.9. Statistical Analysis

IBM SPSS Statistics 20.0 software was used for the Statistical analysis of the data. Socio demographic characteristics of the participants were expressed as mean, standard deviation, percentage and rates. The distribution of the data was evaluated with the Kolmogorov-Smirnov test and it was determined that the data showed a normal distribution. One-Way Anova (with Tukey post-hoc analyse) were used to analyse the differences between the group averages. The relationships among the parameters were evaluated by Pearson's correlation coefficient. A p value of < 0.05 was considered to be statistically significant.

2.10. Ethical considerations

This study was carried out in accordance with the guidelines of the Declaration of Helsinki. The ethical approval of this study was obtained by the Presidency of Clinical Research Ethics Committee of Süleyman Demirel University Faculty of Medicine (receipt no. 204). All participants gave written informed consent.

3. RESULTS

The mean age of all cases was 69.15±4.37 years. The comparison of sociodemographic characteristics of the groups are shown in Table 1. The sociodemographic characteristics were not significantly different between groups except for weight and BMI (Table 1).

The mean SMMT score was 27.4±1.8 points. The mean SMMT score was significantly higher in Group II than in Group I ($p<0.05$). GDS scores did not differ significantly between the groups ($p>0.05$) (Table 2).

Table 1. *Physical properties of cases*

		Group I n=30	Group II n=30	Group III n=30	p
Age (years) $\bar{x}$ ± SD		70.6±4.3	68.0±3.9	68.8±4.5	0.063*
Height (m) $\bar{x}$ ± SD		1.56±0.7	1.58±0.7	1.57±0.6	0.587*
Weight (kg) $\bar{x}$ ± SD		56.7±5.9	71.0±7.6	85.1±8.8	<0.001*
BMI (kg/m²) $\bar{x}$ ± SD		23.0±1.5	27.9±1.2	34.4±3.5	<0.001*
Presence of Chronic Illness n/(%)		30 (100%)	28(93%)	30(100%)	0.129⸸
Living Situation n/(%)	Alone	16(53.3%)	14(46.7%)	12(40%)	0.276⸸
	With family members	14(46.7%)	16(53.3%)	18(60%)	
Education level n/(%)	Low	9(30%)	19(63.3%)	2(6.7%)	0.359⸸
	Medium	3(10%)	25(83.3%)	2(6.7%)	
	High	8(26.7%)	21(70%)	1(3.3%)	

*$\bar{x}$: Mean, SD: Standart Deviation, n: number of cases, BMI: Body Mass Index, kg: kilogram, m: meter, m²: meters per square, *: One Way Anova test, ⸸: Chi square test*

Table 2. *Mini mental test and geriatric depression scale scores of cases*

		$\bar{x}$	SD	p*
Mini Mental Test	Group I	26.77[a]	0.32	**.025**
	Group II	28.03[b]	0.35	
	Group III	26.43[ab]	0.29	
Geriatric Depression Scale	Group I	2.73[a]	1.22	.447
	Group II	2.60[a]	1.35	
	Group III	3.00[a]	1.11	

$\bar{x}$: Mean, SD: Standart Deviation, p: One Way Anova test. a, b,c: Values followed by different letters in columns differ significantly.*

Table 3. *PASE, SPPB, TUG, Functional Limitation and SF-12 Scores of Cases*

	Group I $\bar{x}$ ± SD	Group II $\bar{x}$ ± SD	Group III $\bar{x}$ ± SD	p*
PASE	127.82[a] ±6.80	102.35[b] ±9.20	76.21[c] ±5.28	**<0.001**
SPPB	11.06[a] ±0.69	9.70[b] ±1.14	8.30[c] ±1.78	**<0.001**
TUG	8.24[a] ±0.34	10.19[b] ±0.56	11.96[c] ±0.56	**<0.001**
Functional Limitation	1.90[a] ±1.21	4.63[b] ±4.03	5.56[bc] ±3.97	**<0.001**
SF-12 Physical	49.22[a] ±4.16	64.96 [a] ±16.58	41.35[a] ±4.62	.256
SF-12 Mental	59.85[a] ±3.67	65,28[a] ±3,85	62.55[a] ±3,70	.592

PASE: Physical Activity Scale for Elderly, SPPB: Short Physical Performance test Battery, TUG: Timed Up and Go Test, SF-12: Short Form 12, $\bar{x}$: Mean, SD: Standart Deviation, p: One Way Anova test. a,b,c: Values followed by different letters in lines differ significantly.*

PASE and SPPB scores were significantly higher in Group I than in Groups II and III and significantly higher in Group II than in

Group III (p<0.05). Conversely, TUG scores were significantly lower in Group I than in Groups II and III and significantly lower in Group II than in Group III (p<0.05). Functional limitation scores were significantly higher in Groups II and III than in Group I (p<0.05). There was no significant difference between the groups in terms of their scores on SF-12 Physical and Mental subscales (p<0.05) (Table 3).

When the relationships between BMI and physical performance, SMMT, GDS, TUG and functional limitation parameters were investigated, BMI showed a strong negative correlation with physical performance (r :−0.591), moderate negative correlation with PASE (r:−0.427) and moderate positive correlation with TUG (r:0.418) and functional limitation (r: 0.335). There was no significant correlation between BMI and SF-12 Physical and Mental subscales (p>0.05) (Table 4).

Table 4. *The Relationships between BMI and PASE, SPPB, TUG, Functional Limitation*

		BMI	PASE	SPPB	TUG	Functional Limitation	SF-12 Physical	SF-12 Mental
BMI	r	1	-.427**	-.591**	.418**	.335**	.124	.099
	p		**<0.001**	**<0.001**	**<0.001**	**.001**	.243	.351
PASE	r	-.427**	1	.322**	-.213*	-.268*	.074	.117
	p	**<0.001**		.002	.044	.011	.488	.271
SPPB	r	-.591**	.322**	1	.-646**	-.432**	.044	.055
	p	**<0.001**	.002		.000	.000	.677	.610
TUG	r	.418**	-.213*	-.646**	1	.568**	-.124	.047
	p	**<0.001**	.044	<0.001		<0.001	.243	.660
Functional Limitation	r	.335**	-.268*	-.432**	.568**	1	-.202	.285**
	p	**<0.001**	.011	.000	.000		.056	.006
SF-12 Physical	r	.124	-.117	.164	-.063	-.164	1	.306**
	p	.243	.273	.122	.553	.123		.003
SF-12 Mental	r	.099	-.038	-.188	.116	.303**	.306**	1
	p	.351	.723	.076	.276	.004	.003	

*PASE: Physical Activity Scale for Elderly, SPPB: Short Physical Performance test Battery, TUG: Timed Up and Go Test, SF-12: Short Form 12, r: pearson correlation analysis, *: p<0.05 level is significant, **: p<0.01 level is significant.*

4. DISCUSSION

According to the current study; the levels of physical activity, physical performance and functional mobility decreased and that of functional limitation increased with increasing BMI in the elderly. Quality of life scores did not differ according to BMI.

Physical performance reaches maximum levels in the second and third decades of life, and its level tends to decline after this period owing to the physiological changes that occur with increasing age, and the decline in physical performance reaches serious levels when patients are in their 70s. Obesity in old age accelerates this decline and increases the rate of mortality. In fact, studies show that weight loss in the elderly improves physical function, obesity affects physical function negatively and abdominal obesity is associated with low physical activity and function in the elderly (14,15). Consistent with the literature, the results of this study showed that physical activity level decreased as BMI increased.

In their prospective study, Brach et al. observed that overweight and obese individuals had significantly lower physical function levels than normal-weight individuals and that there was no difference between overweight and obese individuals in terms of physical function (15). Chang et al. reported that the levels of physical performance of obese elderly individuals were lower than those of their non-obese peers (16). Ling et al. reported that individuals with a BMI of ≥40 kg/m² had lower TUG scores than those with a BMI of 26–35 kg/m² (16). Previous studies show that physical function and functional mobility levels decrease owing to increased body mass (15-17). Although we use different methods for evaluation; consistent with the literature, physical function and functional mobility levels decreased as BMI increased in our study.

In their cross-sectional study, Barbosa et al. found a significant decrease in all physical performance tests with increasing age, regardless of gender (18). Mickle et al. conducted a study on 312 elderly individuals and reported that the likelihood of lower extremity-related functional limitation was higher in obese individuals than in non-obese individuals (19). Different tests and questionnaires have been used in the literature to determine functional limitations. Most of these are based on performance measurements. Studies show that physical function decreases with increasing age and weight. Consistent with the literature, we found that

functional limitation levels increased as BMI values increased. Functional capacity decreases with age. In the case of obesity accompanying old age, functional capacity decreases further and causes difficulties in daily life activities. In our study, individuals in the obese group stated that they had difficulty in climbing stairs, getting up from and sitting on a chair as well as walking.

When the literature was examined, different studies showing the relationship between obesity and quality of life in the elderly were found. Fjeldstad et al. reported that health-related quality of life was low in the obese elderly (20). Conversely, Sach et al. reported that some health-related quality of life parameters were low in obese women, and the opposite was true in men (21). In our study, quality of life scores did not change according to BMI. We believe that this difference is owing to the different questionnaires used to evaluate quality of life and owing to low quality of life as a result of high percentage of chronic diseases in all three groups.

High BMI results in performance-based measurements to be completed in longer times. Studies show that BMI adversely affects physical activity and physical function, decreases functional mobility levels and increases functional limitation levels (13, 14, 17, 19, 22). In our study, high BMI values were associated with low physical activity and physical performance. Furthermore, individuals with high BMI were found to have high TUG and functional limitation scores.

There are certain limitations to this study. It was conducted on participants living in a specific geographical region and city. In addition, the study was conducted with only female participants; therefore, no comparison could be made according to gender.

5. CONCLUSION

In conclusion, it was determined that obesity causes a decrease in physical function and functional mobility levels and causes functional limitation in elderly women and that quality of life scores are not affected by BMI. In this context, necessary measures should be taken to prevent obesity in the elderly population, and it should be ensured that regular physical activity and exercise becomes a lifestyle not only in old age but also throughout life because it is an important determinant of health and physical function.

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