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RESEARCH

INVESTIGATION OF OBESITY AND DEPRESSION IN A SAMPLE OF TURKISH ELDERLY ADULTS

ABSTRACT

Introduction: The prevalence of obesity has grown in Turkish elderly adults. This study aimed to investigate the relationship between obesity and depression in elderly people. The study also examined demographic data and the relationship between depression and obesity.

Materials and Method: This case-control study was conducted at the University of Kafkas, Kars, Turkey. We included 161 adults (≥65 years old). The body composition of the participants was evaluated with the bio-electrical impedance analysis (BIA). The Hamilton Depression Rating Scale (HDRS) was used to assess the depression status.

Results: Participants were between 65 and 87 years of age (mean, 70.80±5.42 years); 50.9% of them were females, and 82 of them were obese. The depression rate was 54.9% in the obese group, and 49.4% in the non-obese group, and the association between obesity and depression approached the level of statistical significance in women. In this study, 60.9% of the participants had not completed elementary school. The depression rate was higher in participants with low education levels, 98.8% participants lived with at least one other person, and 55.9% had a monthly income of ≥501 Turkish Liras. There is significant association between depression and living alone and low monthly income.

Conclusion: We found that more than half of the participants (including obese and non-obese) were depressed and that living alone and having a low monthly income were higher risk factors for depression than obesity in elderly adults. Thus, our results demonstrated that obesity was not a main risk factor for depression; however, economic status and living arrangements posed a risk.

Key Words: Obesity; Depression; Body Mass Index; Aged.

ARAŞTIRMA

TÜRK YAŞLILARI ÖRNEĞİNDE OBEZİTE VE DEPRESYONUN İNCELENMESİ

ÖZ

Giriş: Obezite sıklığı Türkiye'de yaşlılarda artmaktadır. Bu çalışma, yaşlılarda obezite ve depresyon arasındaki ilişkiyi incelemeyi amaçlamıştır. Çalışma ek olarak demografik değişkenlerin depresyon ve obeziteyle ilişkisini de incelemiştir.

Gereç ve Yöntem: Bu, olgu-kontrol tipindeki çalışma, Kafkas Universitesi, Tıp Fakültesi'nde yapılmıştır. Altmış-beş yaş ve üzeri 161 yetişkin çalışmaya alınmıştır. Katılımcıların beden bileşimleri, Biyo-Elektrik-İmpedans (BEİ) ile değerlendirilmiştir. Depresyon durumunun değerlendirilmesinde, Hamilton Depresyon Derecelendirme Ölçeği (HDDÖ) kullanılmşıtır.

Bulgular: Katılımcıların yaş aralığı 65-87 (ortalama, 70.80±5.42 yıl), %50.9'u kadın ve 82'si obezdi. Depresyon sıklığı obez grupta %54.9, obez olmayan grupta %49.4 tür, ve depresyon ile obezite ilişkisi kadınlarda, istatistiksel anlamlılık sınırına yakın bulunmuştur. Bu çalışmada katılımcıların %60.9'u ilkokulu bitirmemiştir. Depresyon sıklığı, öğrenim düzeyi düşük katılımcılarda yüksektir, katılımcıların %98.8'i en az bir kişiyle birlikte yaşamaktadır ve %55.9'unun aylık geliri ≥501 TL dır. Depresyon, yalnız yaşam ve düşük aylık gelir arasında istatistiksel olarak anlamlı fark vardır.

Sonuç: Bu çalışmada, katılımcıların (obez ve obez olmayan) yarıdan fazlasının depresyonda olduğu, yaşlılarda, yalnız yaşam ve düşük aylık gelirin, depresyon için obeziteden daha yüksek risk unsurları olduğu bulunmuştur.

Anahtar Sözcükler: Obezite; Depresyon; Beden Kütle İndeksi; Yaşlılık.

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Introduction

Obesity and depression have both been associated with many health problems ranging from cardiovascular diseases and diabetes to disability (1,2). It has been shown that an increase in the prevalence of obesity in the elderly could lead to disability, frailty, and premature death by a decline in age-related physical activity (3). The results of a European study, which included Turkey, showed that the predicted prevalence of obesity was 20%–30% in the elderly during 2015 (4). It has been reported that socioeconomic, demographic, and lifestyle factors can contribute to obesity and depression in older adults (5). A longitudinal U.S. study (over a span of 16 years) determined that being overweight orobese elevated the risk of future depression in middle-aged and older adults (6). Many international studies have reported that the prevalence of overweight and obesity increased with age, and obesity-associated diseases commonly appeared in the middle and older ages (7-9). It has also been shown that obese individuals had a significantly lower health-related quality of life (HRQL) (5,10).

The purpose of this study was to compare the rates of depression in obese and non-obese elderly adults. Additionally, this study investigated the relationship between the socio-demographical characteristics of the participants and depression and obesity.

Materials and Method

Setting

The study was conducted at the Obesity Polyclinics of Kafkas University Medical Faculty between November 2014 and January 2015. A total of 161 adults (≥65 years old), including 82 obese and 79 non-obese participants according to body composition analyses, were included in the study. The obese participants were matched by age, gender, educational level, economical level, marital status, and living arrangements with the non-obese participants. The Kafkas University Medical Faculty Ethics Committee approved the study (protocol number: 354-050-99/13), and the participants provided verbal informed consent. The demographic characteristics and measurements were obtained through face-to-face interviews performed at the polyclinics.

Exclusion Criteria

Participants with diabetes mellitus, severe physiological diseases, anti-depressant use, or significant cognitive impairment were excluded from the study.

Potential Confounders

Potential confounders were dichotomized by matching. Ages were classified into 65–74 years and ≥75 years. Educational status was dichotomized into 0–3 years and ≥4 years. Economic status was ascertained by enquiring the mean individual monthly income of the household. Statistical evaluations of the economic status were based on the subjects' average monthly income categories: 500 TRY and less-501 TRY and more. Marital status was dichotomized as either single or married. Living arrangements were dichotomized as none (living alone) andone or more.

Measurements

The Hamilton Depression Rating Scale (HDRS) was used to assess the depression status of the participants because of the broad coverage of the scale (11). The bio-electrical impedance analysis (BIA) (The Jawon X-Scan Plus II®, Hospital Body Composition Analyzer was used for the BIA) was performed for the body composition measurements (12).

Hamilton Depression Rating Scale (HDRS)

The Turkish translation of HDRS was implemented by physicians for the obese and non-obese participants (11). The scale scores were calculated as follows: 0–7 as normal, 8–13 as mild depression, 14–18 as moderate depression, 19–22 as severe depression, and ≤ 23 as very severe depression. The depression scores were dichotomized for analysis as ≤7 (not depressive) and ≥8 (mildly depressive) (11).

Bio-electrical Impedance Analysis

The measuring method of BIA: BIA involved the tetra-polar measurements performed using touch electrodes and the use of these electrodes simultaneously .Among 12 electrodes by selecting plate and hand electrode or ankle and hand electrode at system set op when using ankle electrode option (12). Measurements included BMI, lean body mass (LBM), soft lean mass (SLM), skeletal muscle mass (SMM), total body water (TBW), intra-cellular water (ICW), extra-cellular water (ECW), percent body fat (PBF), visceral fat area (VFA), waist-to-hip ratio (WHR), visceral fat mass (VFM), subcutaneous fat mass (SFM), body fat over (BFO), and odem. The boundaries of the device were 110–200 cm for length, and 10–250 kg for weight, with an applicable age of use of 7–89 years (12). Measures of body composition were conduted in the morning time before feeding and without shoes or socks and with one layer of light clothing

Body Mass Index (BMI)

The BMI was classified according to the World Health Organization guidelines.The five categories of BMI were underweight (<18.5kg/m^2), normal weight (18.5–24.9kg/m^2), preobese/overweight (25–29.9kg/m^2), obesity class I/moderate obesity (30–34.9 kg/m^2), and obesity class II/severe obesity (≥35kg/m^2). For comparison, the BMIs in this study were classified as non-obese (≤ 29.9) and obese (≥30.0) (13). Therefore, an increase in body weight and the decrease in height with age could lead to an overestimation of obesity; the BFO was also examined to compare depression with BMI (14).

Data Analysis

SPSS 20.0 (IP number: 194.27.41.6) software was used for data analysis. The percentage of distributions, frequencies, arithmetic means, and standard deviations (sd) were examined as descriptive statistics. The chi-squared test was used to analyze categorical data. The Spearman's rank correlation analysis was used to evaluate the correlation between the variables. The odds ratio (OR) values were calculated between the categorical variables for risk evaluation; the 95% confidence interval (CI) of the OR values were also given. The threshold for statistical significance was set at $p<0.05$.

Results

The study group ranged in age from 65–87 years old (mean, 70.80±5.42 years) for all participants. The age range in the obese participants was 65–85 years (mean, 70.49±4.96), and in the non-obese participants (mean, 70.95 ± 5.80 years) was 65–87 years. The gender distribution was homogenous (50.9% women, 49.1% men). The age of the women ranged from 65–82 years (mean, 69.89±4.87 years) and age of the men ranged from 65–87 (mean, 71.56±5.85 years). The frequency and distribution results are summarized in Table 1, as the case and control groups (Table 1).

It was found that depression rate was 52.2% in all participants. The depression rate was 54.9% in the obese group and 49.4% in the non-obese group. The percentage of depression was higher in women than in men within the obese group (62.2% of obese women were depressed, while 37.8% of obese men were depressed). It was found that the difference in depression rates between genders within the obese group approached statistical significance level ($p=0.070$). In the non-obese participants, the depression rates were similar in both genders The non-obese male group had a higher depression rate (48.7%) than the obese men (37.8%). According to the HDRS, the depression rate was 4-fold higher in the age group of 65–74 years than in the age group ≥75 years in both the obese and non-obese groups (Table 1). However, this difference was not statistically significant.

Over 60% (60.9%) of participants had <3years of education. The percentage of participants with education levels of<3years was 57.1% in the obese participants and 42.9% in the non-obese participants (Table 1). It has been observed that less educated obese women were more depressed; however, there was no statistically significant relationship between the level of education and depression according to gender in this study. More than half of the elderly adults were married (65.2%). It was determined that the percentages of obesity and depression were approximately 2-folds higher in married participants than in single ones. This difference was not statistically significant.

We found that 44.1% of the study groups had a monthly income of< 500 TRY; the depression rate was higher in the low monthly income group regardless of gender and obesity rates. The relationship between depression and monthly income was not statistically significant. We also observed that 98.8% of participants lived with at least one other person in this study group. There was a statistically significant relationship between living alone and depression in both the obese and non-obese groups (Table 1).

The body composition scale results of the participants (as mean and SD according to gender) are summarized in Table 2. The mean BMI of the obese group was 35.48±3.2 for women and 34.39±4.1 for men. In the non-obese group, the mean BMI was 23.66±3.1 for women and 24.41±3.3 for men (Table 2). There was a statistically significant relationship between the obese and non-obese participants according to gender in all of the BIA segments (Table 2). In Table 2, it has been shown that the consistency of the whole body analysis for the assessment of obesity. The BMI was chosen for comparison because it's one of the most widely used segment. In addition to BMI, the BFO was also examined to compare depression and obesity, therefore an increase in body weight and the decrease in height with age could lead to an overestimation of obesity. It was observed that there was a strong correlation between LBM, SLM, PBF, VFA, WHR, VFM, and SFM according to BMI and BFO to evaluate the obesity (Table 3).

We found a non-statistically significant relationship and correlation between HDRS and BMI and BFO (Tables 3,4) and a negative correlation was found between HDRS and LBM and SLM. But these correlations were not statistically significant (Table 3).

Table 1— Socio-demographic Characteristics of the Obese and Non-obese Groups and Their Relationship with the HDRS.

Characteristics		Obese ≥30		Non-obese <30		Total	Non-Obese HDRS ≤7		Non-Obese HDRS ≥8		Obese HDRS ≤7		Obese HDRS ≥8		HDRS*
		n	%	n	%	n	n	%	N	%	n	%	n	%	p**
Gender	Female	41	50.0	41	50.0	82	20	50.0	20	51.3	13	35.1	28	62.2	0.070
	Male	41	51.9	38	48.1	79	20	50.0	19	48.7	24	64.9	17	37.8	
Age	65-74	66	80.5	56	70.9	122	24	60.0	32	82.1	30	81.1	36	80.0	0.109
	≥75	16	19.5	23	29.1	39	16	40.0	7	17.9	7	18.9	9	20.0	
Educational Level	≤3 years	56	57.1	42	42.9	98	20	51.3	22	56.4	19	51.4	40	66.7	0.258
	≥4 years	31	49.2	32	50.8	63	19	48.7	19	49.9	18	48.6	15	33.3	
Marital Status	Married	54	65.9	51	64.6	105	26	65.0	25	64.1	25	67.6	29	64.4	0.795
	Single	28	34.1	28	35.4	56	14	35.0	14	35.9	12	32.4	16	35.6	
Monthly Income	≤500 TRY	35	42.8	36	45.6	71	7	17.5	29	74.4	5	13.5	30	66.7	**0.003**
	≥501 TRY	47	57.2	43	54.4	90	33	82.5	10	25.6	32	86.5	15	33.3	
Living Arrang.	Not alone	81	98.8	78	98.7	159	40	100.0	38	97.4	37	100.0	44	97.8	**0.040**
	Alone	1	1.2	1	1.3	2	-	-	1	2.6	-	-	1	2.2	
Total		**82**	**50.9**	**79**	**49.1**	**161**	**40**	**50.6**	**39**	**49.4**	**37**	**45.1**	**45**	**54.9**	

n: frequency; %: percentage; *HDRS: Hamilton Depression Rating Scale; **p: Level of Significance.

Table 2— Mean Values of the Bio-Electrical Impedance Segments According to Gender.

		Women					Men				
		Min	**Max**	**Mean**	**sd***	**p****	**Min**	**Max**	**Mean**	**sd***	**p****
BMI	Obese	30.40	41.20	35.48	3.251	**0.000**	30.10	45.00	34.39	4.197	**0.000**
	Non-Obese	18.00	29.60	23.66	3.119		18.00	29.80	24.41	3.391	
LBM	Obese	26.80	87.80	54.36	11.782	**0.005**	36.70	78.40	57.75	8.254	**0.000**
	Non-Obese	38.60	58.60	48.24	5.595		40.20	58.60	50.21	5.133	
SLM	Obese	23.90	82.00	49.80	11.176	**0.011**	33.50	72.20	53.14	7.763	**0.000**
	Non-Obese	35.30	54.30	44.72	5.189		37.50	54.30	46.57	4.719	
SMM	Obese	4.90	60.70	27.17	10.693	**0.029**	16.40	46.70	31.00	7.475	**0.000**
	Non-Obese	16.90	32.20	22.66	5.016		16.90	32.20	24.17	4.716	
TBW	Obese	19.30	63.20	39.13	8.478	**0,005**	26.40	56.40	41.57	5.939	**0.000**
	Non-Obese	27.80	42.20	34.74	4.028		28.90	42.20	36.15	3.699	
ICW	Obese	2.70	37.00	22.47	6.011	**0.040**	15.60	33.50	24.67	3.531	**0.000**
	Non-Obese	16.60	25.40	20.69	2.424		17.10	25.40	21.46	2.270	
ECW	Obese	8.10	26.20	15.94	3.469	**0.004**	10.80	22.90	16.90	2.444	**0.000**
	Non-Obese	11.20	17.30	14.05	1.646		11.80	17.30	14.69	1.493	
PBF	Obese	10.40	49.70	32.39	9.371	**0.000**	13.00	41.80	28.10	6.927	**0.000**
	Non-Obese	10.30	34.50	20.21	4.825		10.30	29.10	19.32	4.574	
VFA	Obese	55.00	373.00	165.22	66.770	**0.000**	25.00	319.00	146.29	57.579	**0.000**
	Non-Obese	54.00	145.00	102.98	17.530		54.00	173.00	103.33	24.661	
WHR	Obese	0.80	1.12	0.96	0.059	**0.000**	0.71	1.13	0.96	0.078	**0.000**
	Non-Obese	0.80	0.98	0.91	0.038		0.80	1.01	0.91	0.046	
VFM	Obese	1.10	8.50	4.14	1.678	**0.000**	1.00	7.30	3.59	1.501	**0.000**
	Non-Obese	0.60	3.00	1.73	0.580		0.60	3.60	1.75	0.724	
SFM	Obese	9.10	39.90	21.83	7.156	**0.000**	8.10	38.70	19.23	5.991	**0.000**
	Non-Obese	4.50	17.70	10.68	3.186		4.50	17.50	10.57	3.355	
BFO	Obese	10.20	48.40	25.98	8.760	**0.000**	11.20	46.00	22.82	9.376	**0.000**
	Non-Obese	1.80	20.30	12.07	4.072		1.80	21.10	11.96	4.365	

*SD: Standard Deviation; **p: Level of Significance; data are shown as the mean ± 1SD.

BMI: Body Mass Index; LBM: Lean Body Mass; SLM: Soft Lean Mass; SMM: Scelateal Muscle Mass; TBW: Total Body Water; ICW: Intra Celluler Water; ECW: Extra Cellular Water; PBF: Percent Body Fat; VFA: Visceral Fat Area; WHR: Waist to Hip Ratio; VFM: Visceral Fat Mass; SFM: Subcutaneous Fat Mass; BFO: Body Fat Over.

Table 3— Correlations Among the Bio-Electrical Impedance Segments According to BMI and BFO.

		BMI	LBM	SLM	PBF	WHR	VFM	SFM	BFO	HDRS
BMI	Rho*		.519	.487	.527	.725	.878	.907	.902	0.197
	p**		.000	.000	.000	.000	.000	.000	.000	0.123
LBM	Rho			.998	.990	.234	.332	.333	.322	**-0.077**
	p			.000	.000	.003	.000	.000	.000	0.330
SLM	Rho				.989	.209	.299	.299	.288	**-0.076**
	p				.000	.008	.000	.000	.000	0.340
PBF	Rho					.209	.317	.328	.319	0.061
	p					.008	.000	.000	.000	0.443
WHR	Rho						.898	.824	.823	0.065
	p						.000	.000	.000	0.410
VFM	Rho							.982	.973	0.074
	p							.000	.000	0.349
SFM	Rho								.985	0.047
	p								.000	0.558
BFO	Rho									0.181
	p									0.136

*Rho: Spearman's rank correlation coefficient; **p: Level of Significance.

The effect of obesity on depression risk according to gender has been given in Table 4. Obesity elevated the risk of depression in women (OR=1.419, 95% CI: 1.645–2.723) but this result was not significant for CI, including the "1" value. It has been observed that low monthly income and living alone posed a risk of depression in both genders of elderly adults. Low monthly income elevated the risk of depression by 3.7-fold, and living alone elevated the risk of depression by 4.8-fold in elderly adults regardless of obesity, gender, education level,and marital status (Table 4).

Discussion

In this study, it was determined that obesity was a small risk factor for depression in elderly women. However, living alone and low economical levels had a higher risk of depression than obesity in elderly adults of both genders. Different results have been reported in the literature about the association between obesity and depression. In many national and international studies, it has been reported that obesity was associated with depression (6,14,15). In one meta-analysis, the authors determined that there was a reciprocal link between obesity and depression; they showed that obesity increased depression and depression was predictive of the development of obesity (16). Lasserre *et al* reported that a major depressive disorder was a strong predictor of obesity (17). However, Roberts *et al* revealed that obesity increased the risk of depression at baseline, but depression did not increase the risk of future obesity (18). In a study that investigated the association between depression, anxiety, and physical fitness parameters in Turkish obese adults, the authors determined that there was no significant difference in the depression and anxiety scores between the obese and control groups in women. However, the authors stated that there were higher anxiety scores in obese men (19). These reports suggested that the relationship between obesity and depression needed to be further investigated.

In the current study, it was found that the depression rates were 2-fold higher in obese elderly women than in obese elderly men. This result was consistent with the study reported from Arterburn *et al* that demonstrated that the prevalence of depression increased 4-fold in women with severe obesity (1). Pratt *et al* reported that adults with depression were more likely to be obese than adults without depression, and they determined that among individuals with depression, women were more likely to be obese than men (2). In the current study groups, obesity and depression rates were higher in women than in men, and it was determined that obese women were more depressed. However, there was no relationship observed between obesity and depression in the male participants. Moreover, there was a higher rate of depression in non-obese men.

Table 4— The Depression Risk of Characteristics According to Gender.

Characteristics	Categorization	Women	Men	Total	HDRS		
		n (%)	n (%)	n (%)	p	OR*	(95% CI)**
Age	65-74	64 (79.0)	58 (72.5)	122 (75.8)	0.696	1.022	(0.928-1.105)
	≥75	18 (21.0)	21 (27.5)	39 (24.2)			
Educational Level	≤3	55 (65.4)	43 (55.0)	98 (60.9)	0.125	1.526	(1.092-2.213)
	≥4	28 (34.6)	36 (45.0)	64 (39.3)			
Marital Status	Married	46 (56.8)	59 (73.8)	105 (65.2)	0.767	1.071	(0.834-1.956)
	Single	36 (43.2)	20 (26.2)	56 (34.8)			
Monthly Income	≤500 TRY	40 (48.1)	31 (40.0)	71 (45.4)	**0.003**	3.725	**(3.008-4.117)**
	≥501 TRY	42 (51.9)	48 (60.0)	88 (54.6)			
Living Arrangement	Alone	0 (0.0)	2 (2.5)	2 (1.2)	**0.033**	4.826	**(3.074-5.102)**
	Not alone	82 (97.5)	77 (100.)	159 (98.8)			
Body Mass Index	≥30	42 (50.6)	40 (49.4)	82 (50.3)	0.076	1.401	
	(1.114-1.902)						
	<30	40 (51.2)	39 (48.8)	79 (49.7)			
Body Fat Over	≥10	42 (50.6)	40 (49.4)	82 (50.3)	0.081	1.397	(1.087-1.763)
	<9	40 (51.2)	39 (48.8)	79 (49.7)			

*OR: Odds Ratio; **CI: Cluster Interval.

The most striking result of this study was the higher rate of depression than in the results of previously-reported studies in Turkey. Yaka *et al* determined that the prevalence of depression was 18.5% in an urban area (15). Kulaksızoğlu *et al* also reported that the depression rate was 16% in another urban area and demonstrated higher depression rates among women in the community-dwelling elderly population (20).

The current study was conducted in a rural area of Turkey. It is well known that regional and economic disparities affect the mental and physical health of elderly adults (21). In several studies, it has been stated that psycho-social, socio-economic, and demographic issues can contribute to obesity and depression in elderly adults (5,14).

This study focused on understanding how two common health problems (obesity and depression) were associated in elderly adults, but it found that there was a need to determine the prevalence of depression and obesity in elderly adults living in this region. In our current small sample group, we found that living alone and low economicstatus were higher risk factors for depression than obesity in elderly adults. Parlar *et al* also reported that depression was higher in the elderly population that lived alone (22). Yaka *et al* determined that 80% of the depressed elderly adults had at least one chronic disease, including diabetes mellitus (18.3%) (15). They showed that female gender, low educational status, chronic disease, perceived economic inadequency, and dependency on someone were major risk factors for depression in the community-dwelling elderly population (15).Yaka *et al* stated that higher education level was associated with lower rates of depression in their study. (15). Also in our study, it was seen that less educated obese women were more depressed. Although a higher depression rate was associated withthe female gender and a low educational level in our study, this relationship was not significant statistically.

The main limitation of the study was that this was a small sample group in a cross-sectional survey. A longitudinal study could be more valuable for determining the relationship between obesity and risk of depression. In addition to the demographics, the individual, social, and environmental factors should be investigated to determine the relationships between obesity and depression. The strength of the study was that this was the first study to investigate an association between obesity and depression in elderly adults living in a relatively undeveloped region of Turkey.

Our results demonstrated that depression was a more common health problem than expected among the elderly adults living in this region. Public health policies should be established to provide reachable, effective, and sustainable health services for elderly adults according to the needs of the region. The physical activity and healthy eating behaviors among the older adults need to be supported to prevent and

manage obesity and depression. The public and geriatrics services should be strengthened in this region to promote healthy aging.

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