

**RESEARCH
ARTICLE**

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Mediation Effect of Depression on the Association between Food Addiction and Body Image in Individuals with Obesity

ABSTRACT

Objective: This study aimed to examine the mediation effect of depression on the association between food addiction and body dissatisfaction in patients who seek for treatment for obesity.

Methods: The study population consisted of 105 patients admitted to an obesity center in a university hospital. Data from were collected with the patient information form, the Yale Food Addiction Scale, the Beck Depression Inventory, and the Body Image Scale. The direct relationship between food addiction and body dissatisfaction and the mediating effect of depression in the relationship between these two constructs were examined using multi-group structural equation modeling analysis by gender.

Results: The mean age of the patients was 50.22±10.05, 86.8% of them were females. The mean body mass index of the patients was calculated as 40.29±6.67. It was determined that 38.7% of the sample met the food addiction diagnosis criteria. It was found that 39.1% of females and 35.7% of males had food addiction. As a result of the modeling analysis, it was determined that there was no direct pathway between body dissatisfaction and food addiction, depression symptoms complete mediated the relationship between these two constructs. Results of multi-group analysis showed that the mediation model was consistent across gender.

Conclusions: In the treatment of obesity cases in which food addiction and body image disorders coexist, examining the existence of depression and treating it can increase the success rate.

Keywords: Food Addiction, Body Image, Depression, Obesity, Mediation.

Obezite Sorunu Olan Bireylerde Yeme Bağımlılığı ile Beden İmajı Arasındaki İlişkide Depresyonun Aracılık Etkisi

ÖZET

Amaç: Bu çalışmada, obezite sorunu olan ve tedavi programına başlamış hastalarda yeme bağımlılığı ile beden memnuniyetsizliği arasındaki ilişkide depresyonun aracılık etkisinin incelenmesi amaçlanmıştır.

Gereç ve Yöntem: Çalışmanın örneklemini bir üniversite hastanesinin obezite merkezine başvuran 105 hasta oluşturdu. Veriler hasta bilgi formu, Yale Yeme Bağımlılığı Ölçeği, Beck Depresyon Envanteri ve Beden İmajı Skalası ile toplandı. Yeme bağımlılığı ile beden memnuniyetsizliği arasındaki direkt ilişki ve bu iki yapı arasındaki ilişkide depresyonun aracılık etkisi cinsiyetlere göre çoklu grup yapısal eşitlik modellemesi analizi ile incelendi.

Bulgular: Çalışmaya katılan hastaların yaş ortalaması 50,22±10,05 ve %86,8'i kadındı. Hastaların beden kitle indeksi ortalaması 40,29±6,67 olarak hesaplandı. Örneklemin %38,7'sinin yeme bağımlılığı tanı kriterlerini karşıladığı belirlendi. Kadınların %39,1'inde, erkeklerin %35,7'sinde yeme bağımlılığı olduğu saptandı. Modelleme analizi sonucunda yeme bağımlılığı ile beden memnuniyetsizliği arasında doğrudan bir ilişkinin olmadığı, depresyonun bu iki yapı arasındaki ilişkiye tam aracılık ettiği tespit edildi. Çoklu grup analizinin sonuçları, aracılık etkisinin cinsiyetler arasında tutarlı olduğunu gösterdi.

Sonuç: Yeme bağımlılığı ve beden imajı bozukluklarının bir arada olduğu obezite vakalarının tedavisinde depresyon varlığının incelenmesi ve tedavi edilmesi başarı oranını artırabilir.

Anahtar Kelimeler: Yeme Bağımlılığı, Beden İmajı, Depresyon, Obezite, Aracılık.

INTRODUCTION

Obesity, which arises as a result of imbalance between energy intake and energy expenditure, has a complex etiology (1). Although there have been significant advances in studies on obesity in recent years, the increase in its prevalence is continuing, which has caused different factors to come to the fore in the etiology of this chronic disease. Within this framework, food addiction (FA) has entered into the literature as a new concept related to food intake (2,3).

Eating behavior is regulated by two different systems. It is stated that the balance can be maintained in eating controlled by the homeostatic system; however, in the hedonic system, the association of the reward system of brain with taste and pleasure is triggered by certain foods, which results in overconsumption of these foods (3). FA involves the notion that tasty foods, which are usually processed and contain high amounts of carbohydrate and calories, might have an addictive potential. Moreover, overeating in certain forms might represent addiction behavior (5). Some foods affect the reward system of brain and the regions associated with dopaminergic system, which results in the stimulation of reward pathways, the development of withdrawal symptoms, and the loss of control over the behavior of eating (2,3). FA particularly overlaps with Bulimia Nervosa (BN) and Binge Eating Disorder (BED) in terms of psychopathology (for example, decreased control over the behavior of eating, ongoing use despite negative consequences). However, FA is characterized by biopsychological symptoms such as withdrawal and tolerance. (5,6).

FA is most commonly assessed through the Yale Food Addiction Scale (YFAS), which was prepared based on the addiction criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (4). In prevalence studies carried out in the general population using the YFAS, FA varied between 4% and 26% (7-9). This rate increased from 7% to 38% in studies carried out with obese patient groups (10-13) and from 16% to 54% in patients who underwent bariatric surgery (14-16). Moreover, society-based studies report that FA is observed more in female sex (7,17,18), while studies carried out in obese patient groups report that sex difference did not affect FA prevalence (10,12,14). There are different results in the literature related to age variable, another predictor of FA. In the meta-analysis by Pursey et al. (2014) (18), it was found that FA is observed more among individuals aged over 35 years. Moreover, in their study conducted with patients applying for obesity treatment, Eichen et al. (12) reported that FA severity is negatively correlated with age.

Studies carried out in obese patient groups demonstrate that FA is strongly correlated with psychopathological status (12,13,19). Addiction processes and depressive symptoms are affected in

dopaminergic ways, which may affect food choice and eating behaviors in affective disorders (3). A positive relationship was reported between depression and FA among obese adults by Burmeister et al. (19) and among overweight and obese women in Özkan et al. (13). Furthermore, Bourdier et al. (20), in their study with young adults, reported that there is a positive association between FA and psychological distress (depression and anxiety) regardless of sex. The same study also reported that FA has a mediating role in the effect of psychological distress on body mass index (BMI).

Body image (BI) has been conceptualized as a complex and multidimensional construct with perceptual, affective, cognitive, and behavioral components. Body image is formed during the personal developmental process of individuals by their experiences, the value attached to their own BI, the ideas and attitudes of others about their physical appearance, and the reactions they show to them. When there is a discrepancy between the body appearance and the ideal BI of individuals at any period, their BI perception may also change (21). When compared with other psychopathological structures often associated with FA in recent years (for instance emotion dysregulation and depression), BI was a topic that was less emphasized (6). However, in studies carried out recently with different clinical or non-clinical age groups, it was shown that there is a negative relationship between FA symptoms and body satisfaction (17) and body uneasiness is independently related with FA symptoms (6). Studies conducted with obese patients report that those with a FA diagnosis have higher anxiety related to weight and body shape (22) and body shame increases as the severity of FA rises (19). In these studies, it is possible that the association between FA and body dissatisfaction may be mediated by other potential socio-demographic (e.g., sex and age) and clinical (e.g., depressive symptoms, emotion dysregulation, BMI) variables, though partially.

In the light of previous knowledge, this study aimed to assess the mediation effect of depression on the association between food addiction and body dissatisfaction in patients who seek for treatment for obesity and who will participate in programs in which behavioral change is applied according to sex by means of the Structural Equation Model (SEM). At the same time, the suitability of the mediation effect model was tested by including the variables of BMI and age, which can be shared variables, into the modelling.

MATERIAL AND METHODS

Study Sample: The study population consisted of patients applying to an obesity center in a university hospital. The obesity center was

taken into service in November 2018 and it implements behavioral change treatment for obesity. From the date the center was taken into service to the date when the study was planned (November 2019), a total of 144 patients applied to the center.

Patients aged over 18 years with a BMI of 30 and over, who were literate and were accepted to the weight loss program, were taken into the study scope. Those who had major central nervous system diseases (epilepsy, dementia, etc.) or diagnosed psychiatric disorders (bipolar disorder, depression, schizophrenia, etc.) and who used psychiatric medication were not included in the study.

The sample size was determined, on the basis of a 95% confidence interval and 5% sampling error, using the formula shown below. The frequency rate of a case was accepted as 0.5 to calculate the maximum sample size for the population. The formula used for the calculation of sample size:

- N: Number of patients in the universe
- n: Number of individuals to be sampled
- p: Frequency rate of a case (probability of occurrence)
- q: Frequency rate of the absence of a case (probability of non-occurrence)
- t: Theoretical value found according to table t, at a specific significance level
- d: Accepted sampling error according to incidence of the case

$$n = \frac{N \times t^2 \times p \times q}{d^2 (N-1) + t^2 \times p \times q} = 105$$

Data Collection: The data were collected through the Patient Information Form, the Yale Food Addiction Scale (YFAS), the Beck Depression Inventory (BDI), and the Body Image Scale (BIS).

Patient Information Form: The question form developed by the researchers involved questions related to socio-demographic characteristics such as age, sex, marital status, employment status, educational status. The existence of chronic diseases, the history of psychiatric disorders, and the use of cigarette-alcohol were questioned with regard to the patients' health characteristics.

Yale Food Addiction Scale: The YFAS was developed by Gearhardt et al. (23) in order to determine the symptoms of addiction to certain kinds of food. Turkish validity and reliability of the scale was performed by Bayraktar et al. (24) and the Cronbach's alpha value was found to be 0.93. It was calculated as 0.72 (Kuder-Richardson's alpha) in our study. The YFAS is a 27-item scale used to find out eating behaviors like addiction in the last 12 months. The questions in the scale are similar to the criteria related to drug addiction in DSM-IV and the development of the test was completed in line

with these criteria. The following substance dependence symptoms were revised to apply to eating behaviors: (1) substance taken in greater quantity and for longer than intended; (2) persistent desire or unsuccessful repeated attempts to quit; (3) great time and effort to obtain, use, and recover from substance; (4) involvement in important life activities stopped or reduced; (5) continued use despite problems; (6) tolerance; and (7) withdrawal. The scale has two scoring systems. Experiencing a situation regarding clinical sensitivity and encountering 3 or more symptoms out of 7 are accepted as the reasons for reaching a diagnosis. Moreover, a continuous score is calculated by adding the number of symptoms encountered. In this study, the option of diagnostic scoring (descriptive statistics section) was used to assess the prevalence of persons who met FA criteria and the option of counting the number of symptoms was used for the rest of the analyses.

Beck Depression Inventory: The inventory was developed by Beck et al. (25) and its validity and reliability for Turkey was performed by Hisli (26). It is a self-assessment scale consisting of 21 items with 4 choices [a (0), b (1), c (2), d (3) points]. It questions how individuals have felt within the last week, including the day the test is implemented. In the assessment of the scale, the scores are added (it is possible to collect 63 points at most) and a high total score indicates the level or severity of depression is high. The Cronbach's alpha coefficient of the scale was calculated as 0.76 for this study.

Body Image Scale: This scale was developed by Secord and Jourard (27). Its validity and reliability was tested and the scale was adapted to the Turkish society by Hovardaoğlu (28). The scale, which is used to find out the ideas of individuals about their body features, consists of 40 items scored between 1 and 5 and the total score that can be obtained from the scale varies between 40 and 200. A high total score indicates a high BI satisfaction ["very satisfied (5)", "moderately satisfied (4)", "undecided (3)", "slightly unsatisfied (2)", and "very unsatisfied (1)"] (Hovardaoğlu, 1993). The Cronbach's alpha coefficient of the scale was calculated as 0.70 for this study.

The data were collected through face-to-face interview method. The height of the patients was measured without shoes by a stadiometer in the patient training room. The body weight, on the other hand, was measured with one layer of clothing on, without shoes and any extra clothing, using a Tanita BC418 Body Analysis Device.

Ethical Considerations: The present study protocol was conducted in accordance with the Declaration of Helsinki. Ethical permission to carry out the study was obtained from the Non-Invasive Clinical Research Ethics Committee of Düzce University (Dated: 04.11.2019, Consent No: 2019/235). The aim of the study was explained to

the patients and their written approvals were obtained.

Statistical Analysis: The analysis of the data was completed using the IBM SPSS 21.0 software and IBM SPSS AMOS 22.0 software. Continuous variables were displayed as mean ± standard deviation and categorical variables as number and percentage. The Cronbach's alpha and the Kuder-Richardson's alpha of reliability were used to measure internal consistency. The normality of data distribution was assessed with the Kolmogorov-Smirnov test. The correlation between variables that did not show a normal distribution and continuous variables were tested using the Spearman's Rho. Comparisons in terms of the sex variable were performed with the Mann-Whitney U and the Yates Chi-Square tests.

In the second step of the analysis, multiple-group analysis for structural equation modeling was carried out in terms of the variables observed to be correlated (age, FA, BI, depression) and sex. This step also investigated the mediation effect of depression on the relationship between food addiction and body image perception. In the model established according to the correlation between variables, age was included in the model as external and FA, BI, and depression as internal variables. The data that met the condition of multivariate normal distribution were tested using the maximum likelihood method. First, the suitability of the model was assessed. As the chi-square (χ^2) test, one of the fit indices, is sensitive to the sample size, the chi-square/df value, which is less affected by the sample size, was taken into consideration ($\Delta\chi^2/df$, good fit if <3 , acceptable fit if $3 < \Delta\chi^2/df < 5$). The other fit indices used were: Root Means Square Error Approximation (RMSEA, good fit if < 0.05 , acceptable fit if < 0.08), Standardized Root-Mean-Square Residual (SRMR, good fit if < 0.05 , acceptable fit if < 0.08), Goodness of Fit Index (GFI, good fit if > 0.95 , acceptable fit if > 0.90), Tucker-Lewis Index (TLI, good fit if > 0.95 , acceptable fit if > 0.90), Adjustment Goodness of Fit Index (AGFI, good fit if > 0.95 , acceptable fit if > 0.90), Comparative Fit Index (CFI, good fit if > 0.95 , acceptable fit if > 0.90) (29,30). Finally, bootstrapping analysis with 5000 bootstrapped samples was conducted to test the statistical significance of the mediation effects based on the bias-corrected percentile confidence intervals produced from the bootstrapping analysis. The mediation effect was determined based on whether the values within the 95% confidence interval

obtained with mediation effect analysis performed using the Bootstrap method included zero or not (29). A significance level of .05 were used for all statistical analyses.

RESULTS

Sample Description: The mean age of the patients was 50.22±10.05, 86.8% of them were females, 43.4% were primary and secondary education graduates, and 78.3% were unemployed. Among the sample, 74.5% had one or more chronic diseases and 37.7% had a history of psychiatric disorder. With respect to drug abuse, 12.3% used cigarettes and 1.9% used alcohol. The mean BMI of the sample was 40.29±6.67 (Table 1).

Table 1. Distribution of socio-demographic characteristics of the obese patients (n=106)

Characteristics	n	%	
Sex	Female	92	86.8
	Male	14	13.2
Age, years	50.22±10.05	(Min.-Max. = 24 - 68)	
Marital status	Married	92	86.8
	Single	14	13.2
Status of employment	Employed	23	21.7
	Unemployed	83	78.3
Educational status	Primary-	46	43.4
	Secondary School	35	33.0
	High School University	25	23.6
Chronic disease	Yes	79	74.5
	No	27	25.5
Psychiatric disease history	Yes	40	37.7
	No	66	62.3
Smoking	Yes	13	12.3
	No	93	87.7
Alcohol use	Yes	2	1.9
	No	104	98.1
BMI kg/m ²	40.29± 6.67	(Min.-Max. = 30.02 – 60.88)	

BMI: Body Mass Index, Mean ± Standard Deviation, Min.-Max.: Minimum-Maximum

Bivariate Associations: Correlation relationships was presented in Table 2. It was determined that there was a moderately positively association between YFAS and BDI and a weak negatively association between YFAS and BIS. However, there was a moderately negative association between BDI and BIS. While no association was detected between BMI and YFAS and between BDI and BIS, a moderately negative association was found between YFAS and age and between BDI and age (Table 2).

Table 2. Correlation matrix of the variables of interest

Variables	1	2	3	4	5
1. YFAS-Symptom Count	-				
2. BDI	0.342**	-			
3. BIS	-0.225*	-0.508**	-		
4. BMI	0.159	0.121	-0.172	-	
5. Age	-0.303**	-0.332**	0.150	0.037	-

YFAS: Yale Food Addiction Scale, BDI: Beck Depression Inventory, BIS: Body Image Scale, BMI: Body Mass Index, *p<.05, **p<.01

Group Comparisons According to Sex Differences: There was no statistically significant difference between female’s and male’s age, BMI, and the mean YFAS score. However, the mean BDI score of females was significantly higher than that of males. Similarly, the mean BIS score of females was significantly lower than that of males. The rate

of those who met the FA diagnosis criteria was 38.7% in all the sample. Among the females, 39.1% met the FA diagnosis criteria, while 35.7% of the males met these criteria. There was no statistically significant difference between groups in terms of FA prevalence (Table 3).

Table 3. Characteristics of the sample and sex differences

	All (n=106)	Females (n=92)	Males (n=14)	Test Statistic	p
Age	50.22±10.05 (24-68)	49.67±9.82 (24-68)	53.79±11.91 (34-68)	-1.644	0.100
BMI	40.29± 6.67 (30.02-60.88)	40.18±6.78 (30.02-60.88)	40.97±6.04 (32.11-49.18)	-0.504	0.614
YFAS-Symptom Count	3.30±1.62 (0-7)	3.38±1.66 (0-7)	2.79±1.25 (1-5)	-1.304	0.192
BDI	16.79±6.99 (3-32)	17.53±6.91 (3-32)	11.93±5.58 (3-23)	-2.828	0.005
BIS	119.94±25.24 (70-182)	117.84±24.36 (70-182)	133.79±27.49 (91-175)	-1.965	0.049
FA	41 (38.7)	36 (39.1)	5 (35.7)	0.000	1.000
Non-FA	65 (61.3)	56 (60.9)	9 (64.3)		

Mean ± Standard Deviation (Minimum-Maximum), n(%), YFAS: Yale Food Addiction Scale, BDI: Beck Depression Inventory, BIS: Body Image Scale, BMI: Body Mass Index

Structural Equation Model: Multiple-group analysis for structural equation modeling was carried out in terms of the variables observed to be correlated (age, FA, depression, BI) and sex in the second step of the analysis. The modelling investigated the mediation effect of depression on the relationship between food addiction and body image perception. The structural model established

in the study is given in Figure 1. Within the scope of the analysis, it was investigated whether there was multicollinearity between study variables in the model by the Durbin-Watson coefficient and variance inflation factor (VIF) methods. All these tests produced results confirming that no multicollinearity existed between independent variables (Durbin Watson=1,883, VIF< 5).

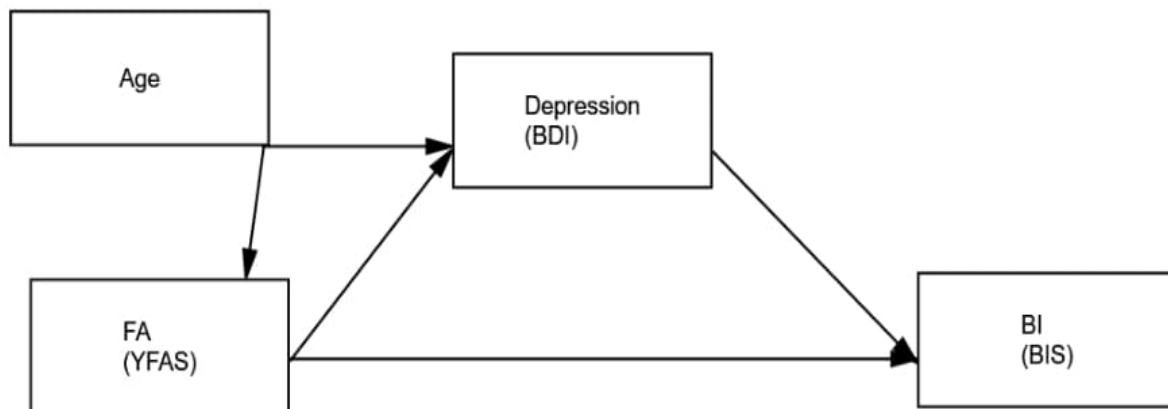


Figure 1. Structure Equation Model

When the fit indices of the model were examined, it was determined that it had good fit values ($\Delta\chi^2/df=0.142$, SRMR=0.0092, RMSEA=0.000, GFI=0.999, TLI=1.092, AGFI=0.993, CFI=1.000).

Table 4 presents the analysis results of the SEM. It was observed that in females, as age decreased, FA symptoms increased, whereas in

males age did not have a significant effect on FA symptoms (females: $\beta=-0.31$, $p=0.002$; males: $\beta=-0.14$, $p=0.613$). Similarly, in females, depression was negatively affected as age decreased; however, in males, age did not have a significant effect on depression (females: $\beta=-0.27$, $p=0.006$; males: $\beta=-0.01$, $p=0.979$).

Table 4. Direct, indirect, and total effects of the Structural Equation Model

	Female			Male		
	β	SE	p	β	SE	p
Age -->FA	-0.31	0.02	0.002	-0.14	0.03	0.613
Age -->DEP	-0.27	0.07	0.006	-0.01	0.16	0.979
FA -->BI (Total effects)	-0.24	1.44	0.016	-0.15	1.44	0.016
R ²		0.06			0.02	
FA -->DEP	0.25	0.39	0.008	0.20	0.39	0.008
R ²		0.18			0.04	
FA --> BI (Direct effects)	-0.06	1.39	0.533	-0.04	1.39	0.979
DEP -->BI	-0.46	0.33	<0.001	-0.44	0.33	<0.001
R ²		0.24			0.21	
	Effect	SE	95% Confidence Interval	Effect	SE	95% Confidence Interval
Indirect effects	-0.12	0.05	-0.222 -0.010	-0.09	0.05	-0.187 -0.007

Bootstrap resampling: 5000, Standardized regression coefficients have been given. YFAS: Yale Food Addiction Scale, BDI: Beck Depression Inventory, BIS: Body Image Scale, SE: Standard error

In both sexes, it was found out that the total effect of FA on BI was significant and FA negatively affected BI (females: $\beta=-0.24$, $p=0.016$; males: $\beta=-0.15$, $p=0.016$). In both females and males, it was seen that FA negatively affected depression, which was the mediating variable, (females: $\beta=0.25$, $p=0.008$; males: $\beta=0.20$, $p=0.008$) and depression also affected BI negatively (females: $\beta=0.46$, $p<0.001$; males: $\beta=-0.44$, $p<0.001$). When FA and depression, the mediating variable, were included in the model at the same time, the significant effect of FA on BI disappeared (females: $\beta=-0.06$, $p=0.533$; males: $\beta=-0.04$, $p=0.979$). According to the results, the indirect effect of the mediating variable of depression was significant on both females and males (females: $\beta=-0.12$, 95% CI [-0.222, -0.010]; males: $\beta=-0.09$, 95% CI [0.187, -0.007]). In line with these results, it was determined that depression had a complete mediating role in the relationship between FA and BI.

DISCUSSION

The mechanisms affecting food intake are complicated in obesity, which is defined as a chronic disease. In recent years, it has been suggested that FA might be effective in the fact that obese persons cannot exhibit healthy eating behaviors even though they have a serious health issue (2,3). Studies show that FA has a strong association with psychopathological conditions such as depression, anxiety, poorer emotion regulation, lower self-esteem, internal stigmatization with regard to weight, body dissatisfaction, and body shame. This study investigated the FA rates in individuals participating in behavioral change treatment for obesity and the mediation effect of depression on the relationship between food addiction and body dissatisfaction.

At the end of the study, the rate of those who met the FA criteria and received a FA diagnosis in

the obese patient group was found to be 38.7%. The weighted mean prevalence of FA was reported to be 19.9% in a meta-analysis carried out by Pursey et al. (18), in which they reviewed 20 studies conducted with different populations. It is seen that the rate of FA is lower (4-26%) in society-based studies (7-9). However, in studies carried out with individuals seeking for obesity treatment, it was seen that this rate varied between 7% and 54% and it was higher compared to the general population (10-12,16). In the study by Özkan et al. (13), which was carried out with patients applying for obesity treatment, who were of the same ethnic origin as the present study, the rate of FA was detected as 38%, similar to the results of this study. The FA rates have a wide range in the literature, which suggests that the studies might have been affected by numerous factors such as sample size, ethnic origin, and sex distribution.

Different from this study, the results of society-based studies indicate that FA rate or FA symptoms is higher in females compared to males (7,17,18). This is explained with the fact that females and males have different hormonal profiles and dietary preferences. In studies carried out with patient groups applying for obesity treatment, it was seen that sex did not affect food addiction, which is similar to the results of this study (10,12,14).

Although people with a psychiatric diagnosis were excluded from the study, the results revealed that depressive symptoms were higher in the group with FA and there was a positive association between the FA symptoms and depression, similar to previous studies (10,12,13,31). It is assumed that addiction processes and depressive symptoms are affected by dopaminergic ways. Furthermore, affective disorders such as depression and anxiety can affect food choice and eating behaviors (3). Therefore, it is an expected result that depressive symptoms are high in the group with FA.

Body dissatisfaction is the negative subjective assessment of a person with respect to their body image and it has a consistent and significant relationship with eating disorders (5,32). Studies carried out with patients diagnosed with BED and BN particularly in Western cultures indicated that factors like depression, anxiety, self-esteem, and being exposed to teasing about body image in childhood mediated the association between eating disorders and body dissatisfaction (11,33-37). Previous studies carried out in clinical and non-clinical populations in the Turkish society and in different cultures indicate that those with food addiction have lower body satisfaction level and higher body uneasiness and anxiety levels with respect to their weight and body shapes, and that they are ashamed of their body shapes (6,17,19,22). In the present study, different from the previous studies, it was established that food addiction had a total effect on body dissatisfaction but no direct effect. It was indicated that the negative effect of food addiction on body image appeared by mediation of depression. It was seen that this total mediation effect was valid for both sexes. FA has significant psychopathological overlap (e.g., reduced control over eating, continued use despite problems) with BN and BED. However, FA is not characterized by symptoms related to body image (5,6). The results of the present study support this, indicating that food addiction does not have a direct effect on body image.

Similar to the previous studies carried out with obese patient groups, no significant relationship was detected between BMI and the number of FA symptoms in this study (11,14,19). However, in society-based studies, a correlation was reported between BMI and the number of FA symptoms (8, 9,17). Meule (38) reported that there was a cubic relationship rather than a linear one between BMI and FA based on empirical data. In a cubic relationship, positive correlations are observed in the number of FA for overweight and moderately obese individuals, but this relationship

may not be observed in symptoms of severely obese individuals. The mean BMI of the sample included in the study is 40.29 ± 6.66 , but the minimum and maximum range is wide. There are persons with a severe obesity problem in the sample group. There is no correlation between the FA symptoms and BMI, which can be explained with cubic relationship.

CONCLUSION

In conclusion, it was determined that food addiction rates were high in both female and male obese patients who sought for treatment and the negative effect of food addiction on body image was mediated by depression. FA is one of the important factors that might lead to obesity and it may negatively affect the efforts to lose body weight, and even if positive results are achieved, it may make maintaining the weight difficult. In the treatment of cases in which food addiction and body image disorders coexist, examining the existence of depression and treating it can increase the success rate. Furthermore, we are of the opinion that there is a need for studies on obesity in which surgical and non-surgical treatment methods are used and which are carried out with larger samples with different socio-demographic and psychological characteristics.

Limitations

Though the results of the present study have a unique value, there are limitations with respect to generalizability. To begin with, the study was carried out in a center with a sample group comprising a high female population who sought for treatment. Secondly, although the data collection tools used in the study are valid and reliable, a risk of biased reporting exists as they are self-reporting tools. When assessing food addiction, the previous YFAS version based on the criteria about drug addiction in DSM-IV was implemented. Finally, only depression was assessed among psychopathological conditions for the relationship between food addiction and body image.

REFERENCES

1. Heymsfield SB, Wadden TA. Mechanisms, pathophysiology, and management of obesity. *N Engl J Med.* 2017; 376: 254-66.
2. Lerma-Cabrera JM, Carvajal F, Lopez-Legarrea P. Food addiction as a new piece of the obesity framework. *Nutr J.* 2016; 15: 5. Doi: 10.1186/s12937-016-0124-6
3. Singh M. Mood, food, and obesity. *Front Psychol.* 2014; 5: 925. Doi: 10.3389/fpsyg.2014.00925
4. Gearhardt AN, Corbin WR, Brownell KD. Food addiction an examination of the diagnostic criteria for dependence. *J Addict Med.* 2009; 3: 1-7. Doi: 10.1097/ADM.0b013e318193c993
5. Wiss DA, Brewerton TM. Incorporating food addiction into disordered eating: the disordered eating food addiction nutrition guide (DEFANG). *Eat Weight Disord.* 2017; 22(1): 49-59. Doi: 10.1007/s40519-016-0344-y
6. Imperatori C, Innamorati M, Lamis DA, Farina B, Fabbriatore M, Contardi A. Body uneasiness is associated with food addiction symptoms: A cross-sectional study. *Eur Eat Disord Rev.* 2018; 26(6): 638-44. Doi: 10.1002/erv.2640
7. Nunes-Neto PR, Köhler CA, Schuch FB, Solmi M, Quevedo J, Maes M, et al. Food addiction: Prevalence, psychopathological correlates and associations with quality of life in a large sample. *J Psychiatr Res.* 2018; 96: 145-52. Doi: 10.1016/j.jpsychires.2017.10.003

8. Pedram P, Wadden D, Amini P, Gulliver W, Randell E, Cahill F, et al. Food addiction: Its prevalence and significant association with obesity in the general population. *PLoS One*. 2013; 8(9): e74832. Doi: 10.1371/journal.pone.0074832
9. Gearhardt AN, Boswell RG, White MA. The association of "food addiction" with disordered eating and body mass index. *Eat Behav*. 2014; 15(3): 427-33. Doi: 10.1016/j.eatbeh.2014.05.001
10. Chao AM, Shaw JA, Pearl RL, Alamuddin N, Hopkins CM, Bakizada ZM, et al. Prevalence and psychosocial correlates of food addiction in persons with obesity seeking weight reduction. *Compr Psychiatry*. 2017; 73: 97-104. Doi: 10.1016/j.comppsy.2016.11.009
11. Imperatori C, Innamorati M, Contardi A, Continisio M, Tamburello S, Lamis DA, et al. The association among food addiction, binge eating severity and psychopathology in obese and overweight patients attending low-energy-diet therapy. *Compr Psychiatry*. 2014 55(6): 1358-62. Doi: 10.1016/j.comppsy.2014.04.023
12. Eichen DM, Lent MR, Goldbacher E, Foster GD. Exploration of "food addiction" in overweight and obese treatment-seeking adults. *Appetite*. 2013; 67: 22-4. Doi: 10.1016/j.appet.2013.03.008
13. Özkan İ, Devrim A, Bilgiç P. Hafif şişman ve obez kadınlarda yeme bağımlılığı ile beslenme durumu ve depresyon ilişkisinin değerlendirilmesi. *Bes Diy Derg*. 2017; 45(3): 242-49.
14. Ouellette AS, Rodrigue C, Lemieux S, Tchernof A, Biertho L, Bégin C, et al. An examination of the mechanisms and personality traits underlying food addiction among individuals with severe obesity awaiting bariatric surgery. *Eat Weight Disord*. 2017; 22(4): 633-40. Doi: 10.1007/s40519-017-0440-7
15. Pepino MY, Stein RI, Eagon JC, Klein S, et al. Bariatric surgery-induced weight loss causes remission of food addiction in extreme obesity. *Obesity*. 2014; 22(8): 1792-8. Doi: 10.1002/oby.20797
16. Clark SM, Saules KK. Validation of the Yale Food Addiction Scale among a weight-loss surgery population. *Eat Behav*. 2013; 14(2): 216-9. Doi: 10.1016/j.eatbeh.2013.01.002
17. Şanlıer N, Türközü D, Toka O. Body image, food addiction, depression, and body mass index in university students. *Ecology of Food and Nutrition*. 2016; 55(6): 491-507. Doi: 10.1080/03670244.2016.1219951
18. Pursey KM, Stanwell P, Gearhardt AN, Collins CE, Burrows TL. The prevalence of food addiction as assessed by the Yale Food Addiction Scale: a systematic review. *Nutrients*. 2014; 6(10): 4552-90. Doi: 10.3390/nu6104552
19. Burmeister JM, Hinman N, Koball A, Hoffmann DA, Carels RA. Food addiction in adults seeking weight loss treatment. Implications for psychosocial health and weight loss. *Appetite*. 2013; 60(1): 103-10. Doi: 10.1016/j.appet.2012.09.013
20. Bourdier L, Orri M, Carre A, Gearhardt AN, Romo L, Dantzer C, et al. Are emotionally driven and addictive-like eating behaviors the missing links between psychological distress and greater body weight? *Appetite*. 2018; 1(120): 536-46. Doi: 10.1016/j.appet.2017.10.013.
21. Schwartz MB, Brownell KD. Obesity and body image. *Body Image*. 2004; 1(1): 43-56.
22. Meule A. Back by popular demand: a narrative review of the history of food addiction research. *Yale J Biol Med*. 2015; 88(3): 295-302.
23. Gearhardt AN, Corbin WR, Brownell KD. Preliminary validation of the Yale Food Addiction Scale. *Appetite*. 2009; 52(2): 430-6. Doi: 10.1016/j.appet.2008.12.003
24. Bayraktar F, Erkman F, Kurtuluş E. Adaptation study of yale food addiction scale. *Klinik Psikofarmakoloji Bülteni*. 2012; 22(1): 38.
25. Beck AT, Steer RA, Brown GK. BDI- 2 Beck Depression Inventory. TX: The Psychological Corporation San Antonio; 1996.
26. Hisli N. Beck depresyon envanterinin üniversite öğrencileri için geçerliği, güvenilirliği. *Psikoloji Dergisi*. 1989; 7(23): 3-13.
27. Secord PF, Jourard SM. The appraisal of body-cathexis: Body-cathexis and the self. *Journal of Consulting Psychology*. 1953; 17(5): 343-47.
28. Hovardaoğlu S. Vücut algısı ölçeği. *Psikiyatri, Psikoloji, Psikofarmakoloji (3P) Dergisi*. 1993; 1(1): 26.
29. Kline RB. Principles and Practice of Structural Equation Modeling. 3th ed. The Guilford Press: London New York; 2011.
30. Gürbüz S. Amos ile Yapısal Eşitlik Modellemesi. Seçkin Akademik ve Mesleki Yayınlar: Ankara, Turkey; 2019.
31. Rodrigue C, Ouellette AS, Lemieux S. Executive functioning and psychological symptoms in food addiction: a study among individuals with severe obesity. *Eat Weight Disord*. 2018; 23(4): 469-78. Doi: 10.1007/s40519-018-0530
32. Nightingale BA, Cassin SE. Disordered eating among individuals with excess weight: a review of recent research. *Curr Obes Rep*. 2019; 8(2): 112-27. Doi: 10.1007/s13679-019-00333-5
33. Grilo CM, Masheb RM. Correlates of body image dissatisfaction in treatment-seeking men and women with binge eating disorder. *Int J Eat Disord*. 2005; 38(2): 162-6. Doi: 10.1002/eat.20162
34. Wardle J, Waller J, Rapoport L. Body dissatisfaction and binge eating in obese women: the role of restraint and depression. *Obes Res*. 2001; 9(12): 778-87. Doi: 10.1038/oby.2001.107

35. Stice E. A prospective test of the dual-pathway model of bulimic pathology: mediating effects of dieting and negative affect. *J Abnorm Psychol.* 2001; 110(1): 124-35. Doi: 10.1037//0021-843x.110.1.124
36. Ackard DM, Croll JK, Kearney-Cookei A. Dieting frequency among college females: association with disordered eating, body image, and related psychological problems. *J Psychosom Res.* 2002; 52(3): 129-36. Doi: 10.1016/s0022-3999(01)00269-0
37. Brechan I, Kvaem IL. Relationship between body dissatisfaction and disordered eating: mediating role of self-esteem and depression. *Eat Behav.* 2015; 17: 49-58. Doi: 10.1016/j.eatbeh.2014.12.008
38. Meule A. Food addiction and body-mass-index: a non-linear relationship. *Med Hypotheses.* 2012; 79(4): 508-11. Doi: 10.1016/j.mehy.2012.07.005