

# Factors affecting food addiction in adult women: the effect of depression, body mass index, and body image

## *Fatores que afetam a adição alimentar em mulheres adultas: o efeito da depressão, índice de massa corporal e imagem corporal*

Burcu YEŞİLKAYA<sup>1</sup>  0000-0001-9986-6119

Burcu ATES OZCAN<sup>1</sup>  0000-0003-2627-0167

### ABSTRACT

#### Objective

Food addiction, an increasingly prevalent disorder, involves multiple physiological and psychological factors. It is often associated with obesity and psychiatric disorders. This study aimed to determine the main factors affecting food addiction in women.

#### Methods

In total, 383 adult women were evaluated using an anamnesis form to record participant demographic information and anthropometric measurements, along with the Yale Food Addiction Scale, Beck Depression Inventory, and body perception scale. We created a model according to Beck Depression Inventory, body mass index, age, body perception scale, and marital status, which were thought to influence Yale Food Addiction Scale.

#### Results

Mean participant age was  $30.13 \pm 10.84$  years. Food addiction scores of the participants showed significant positive correlations with body weight, body mass index, and depression scores, and significant negative correlations with the

<sup>1</sup> Istanbul Okan University, Faculty of Health Sciences, Department of Nutrition and Dietetics. Istanbul Okan University, Tuzla Campus, Tepeören District, Ballica Street n. 11/11, 34959, Tuzla, Istanbul, Turkey. Correspondence to: B YEŞİLKAYA. E-mail <burcuyavunc@hotmail.com>.

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body perception scale scores ( $p < 0.05$ ). The results revealed that the Yale Food Addiction Scale score is affected by the Beck Depression Inventory and body mass index. Increase in Beck Depression Inventory and body mass index increased the Yale Food Addiction Scale score by 0.054 and 0.076 units, respectively.

### Conclusion

The main factors affecting emotional eating in women are coexistence of high scores of depression and high body mass index. It is determined that people can have depression, food addiction and obesity at the same time.

**Keywords:** Body image. Body mass index. Depression. Food addiction. Nutrition. Women's health.

## RESUMO

### Objetivo

*A dependência alimentar, um distúrbio cada vez mais prevalente, envolve múltiplos fatores fisiológicos e psicológicos. Muitas vezes está associada à obesidade e distúrbios psiquiátricos. Este estudo teve como objetivo determinar os principais fatores que afetam a dependência alimentar em mulheres.*

### Métodos

*No total, 383 mulheres adultas foram avaliadas por meio de um formulário de anamnese para registrar informações demográficas e medidas antropométricas dos participantes, juntamente com a Escala de Dependência Alimentar de Yale, o Inventário de Depressão de Beck e a escala de percepção corporal. Criamos um modelo de acordo com o Inventário de Depressão de Beck, índice de massa corporal, idade, escala de percepção corporal e estado civil, que foram pensados para influenciar a Escala de Dependência Alimentar de Yale.*

### Resultados

*A idade média dos participantes foi de  $30,13 \pm 10,84$  anos. Os escores da Yale Food Addiction Scale dos participantes mostraram correlações positivas significativas com peso, índice de massa corporal e escores do Inventário de Depressão de Beck, e correlações negativas significativas com os escores da escala de percepção corporal ( $p < 0,05$ ). Os resultados revelaram que o escore da Yale Food Addiction Scale é afetado pelo Inventário de Depressão de Beck e pelo índice de massa corporal. O aumento no Inventário de Depressão de Beck e no índice de massa corporal aumentou a pontuação da Yale Food Addiction Scale em 0,054 e 0,076 unidades, respectivamente.*

### Conclusão

*Os principais fatores que afetam a alimentação emocional em mulheres são a coexistência de altos escores de depressão e alto índice de massa corporal. É determinado que as pessoas podem ter depressão, dependência alimentar e obesidade ao mesmo tempo.*

**Palavras-chave:** Nutrição. Imagem corporal. Dependência alimentar. Saúde da mulher. Depressão. Índice de massa corporal.

## INTRODUCTION

The concept of addiction to food, particularly chocolates, was first reported in the 1890s [1]. Overeating has been considered as a form of addiction because it is a prominent cause of obesity. In the worldwide obesity epidemic, the desire for overeating has raised the term “food addiction”. Food addiction is a behavioral addiction that is associated with activation of the brain reward system in humans and animals, characterized by the compulsive consumption of palatable foods. It has also been described as clinically significant physical and/or psychological dependence on palatable, high fat, and high sugar foods [2,3]. Cravings for such foods have been defined as “implicit wanting” [3]. Food addiction is based on the behavioral and biological parallels between excessive food consumption and drug addiction. Therefore, the predominant idea is that food addiction can have a similar effect on the brain to that of addictive substances [4].

The addictive effects of food additives and their relationship with food addiction were also examined previously. Furthermore, there has been an increase in the awareness with regard to the potential roles of central neurotransmitters such as dopamine and some neuropeptides in food addiction. However, scientific evidence required to categorize any food ingredient, micronutrient, or standard food-additive as an addictive substance is lacking [2].

A study investigating the effects of nutrients on the brain reported that certain nutrients trigger the release of dopamine, particularly in the nucleus accumbens. This has led scientists to speculate that food addiction may be a mechanism developed to compensate for dopamine deficiency in the body. Therefore, it is considered that individuals with depression may develop food addiction [3,5].

Most obesity studies performed in the recent years have focused on food addiction. Owing to the influence of environmental and genetic factors on obesity, it is referred to as a hereditary neurobehavioral disorder. Although the main explanatory factor in the relationship between food addiction and obesity is not clear, factors such as binge eating, and overeating were etiologically associated with obesity. Accordingly, food addiction can be defined as a sub-factor of obesity [3]. Obesity, also known as a multifactorial and complex chronic disease, has not been accepted as a mental disorder by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). However, the current literature has proven that obesity is strongly associated with different psychiatric conditions, addictions, eating disorders, and mood disorders. These comorbidities have also been found to have important effects on the quality of life of patients with obesity [6]. Individuals with morbid obesity show a decrease in dopamine D2 receptors and may develop resistance to leptin, leading to compulsive eating. This overconsumption promotes body weight gain and obesity and increases food consumption. This mechanism causes an increase in the release of endogenous opiates in the body and consequently develops food addiction [1]. According to the latest data, prevalence of obesity and food addiction is higher in women than in men. Reportedly, women are prone to different forms of addictions owing to the effects of female hormones, fertility, pregnancy, breastfeeding, and menopause [7,8].

This study aimed to determine the main factors affecting food addiction in women. Looking at the existing studies with the scales used in this study, it was seen that there is little data on these scales and their relationship with anthropometric measurements. In particular, it was aimed to examine the direct relationship with high Body Mass Index (BMI).

## METHODS

This was an analytical study and it was planned with the women living in Turkey, and 383 women were included in the study [9]. The confidence interval was determined as 95% and the margin of error as 5%, and the sample size was found to be sufficient. Women were selected by simple random sampling method and data were collected through face-to-face questionnaire interviews. A survey was conducted in various neighborhoods and districts to reach women living in Istanbul. Participants were selected according to the following inclusion criteria: the participant should be; a woman aged 18-65 years, voluntary, and non- pregnant. A signed voluntary consent form was obtained from each participant. The study has been approved by a relevant Ethics Committee on 13.03.2019 (Approval number: 104).

The form included the demographic and anthropometric information. Anthropometric information was measured and recorded by the authors. BMI was calculated by dividing body weight (kg) by the square of height (m<sup>2</sup>) and classified according to the World Health Organization (WHO) BMI classification [10]. The BMI values were classified as follows: <18.5kg/m<sup>2</sup>, underweight; 18.5-24.9 kg/m<sup>2</sup>, normal; 25.0-29.9 kg/m<sup>2</sup>,

overweight; 30.0-39.9 kg/m<sup>2</sup>, obese. WHO also defines BMI  $\geq 25$  kg/m<sup>2</sup> as “overweight”, and BMI  $< 25$  kg/m<sup>2</sup> as “non-overweight”. In this study, we focused on the effect of overweight/obesity on food addiction. So, while we were analyzing our data, BMI  $\geq 25$  kg/m<sup>2</sup> were classified as “overweight”, and patients with a BMI  $< 25$  kg/m<sup>2</sup> were classified as “non-overweight”. This helped us to see the relationship between obesity and food addiction.

The Yale Food Addiction Scale Version 2.0 (YFAS 2.0) is the only available scale based on DSM-5 criteria to measure food addiction. It is a 35-item scale developed by Gearhardt *et al.* that evaluates eating attitudes with symptoms of substance addiction. Two scoring options were available: a symptom count version (total number of criteria met in addition to clinical significance ranging from 0 to 11) and a definition scoring (FA diagnosis plus clinically significant disorder and distress when two or more criteria are met). Food addiction severity levels can be classified as mild (2-3 symptom criteria and impairment/distress), moderate (4-5 symptom criteria and impairment/distress), and severe ( $\geq 6$  symptom criteria and impairment/distress). The Turkish version of YFAS 2.0's validity and reliability study was conducted by Buyuktuncer *et al.* [11] and the Cronbach alpha was found to be 0.698. This is a valid and suitable scale for our study.

The Body Perception Scale (BPS), originally named body-cathexis scale, was developed by Secard and Jurard in 1953, and it is a scale that determines an individual's satisfaction with 40 different body parts or functions. The form of the scale used in our country is a five-point (1=“I like it very much,” 2=“I like it,” 3=“I am indecisive,” 4=“I do not like it much,” 5=“I do not like it at all”) Likert-type measuring instrument, which is comprise of 40 items, created by Hovardaoğlu. The most positive statement counts as 1 point, and the most negative statement counts as 5 points. A minimum of 40 and a maximum of 200 points can be obtained on the scale. An increase in the score obtained from the scale is interpreted as an increase in body dissatisfaction (Hovardaoğlu, 1992, our translation) [12].

Beck Depression Inventory (BDI) was used in many studies examining depression according to various variables (working youth, adolescents, and women exposed to violence, among others). This scale was developed by Beck *et al.* (1978) and adapted to Turkish by Hisli (1988,1989). The main purpose of this scale is to determine the severity of depression in the previous week. The scale is a 4-point Likert-type self-report scale consisting of 21 items and each item is numbered as 0, 1, 2, and 3, respectively, according to the severity of depression. In BDI, 1-10 points are considered as Normal, 11-16 points as Mild Mood Disturbance, 17-20 points as Moderate Depression, 21-30 points as Severe Depression, and  $\geq 31$  as Extreme Depression [13].

Normality control of continuous variables was done by Shapiro-Wilk test. Nonparametric tests were used because the variables did not conform to normal distribution. The Mann-Whitney U test was used for comparing two independent groups, and the Spearman Rho coefficient was calculated for the investigation of the relationship between the two continuous variables. A multiple linear regression model was created to observe the effects of other variables on the YFAS score. The Chi-square test was used in the analysis of categorical data. All statistical analysis was done using the SPSS 21 program. Statistical significance was considered at  $p < 0.05$ .

## RESULTS

In total, 383 adult women participated in the study (age=  $30.13 \pm 10.84$  years), of whom 35.8% were married and 44.4% of the participants were employed. Most of the participants were undergraduates (59.5%). Examinations of the BMI distributions revealed that 217 (56.7%) participants had normal BMI, 36 (9.4%) were underweight, 94 (24.5%) were overweight, and 36 (9.4%) were obese (Table 1).

**Table 1** – Sociodemographic status of the participants. Istanbul, 2020.

Variables	Mean (SD)	Min-Max
Age	30.13 (10.84)	18-64
BMI (kg/m <sup>2</sup> )	23.95 (4.68)	15.67-48.89
	n=383	%
Age group		
18-24	144	37.6
25-34	134	35.0
35-44	59	15.4
45-54	33	8.6
55-64	13	3.4
Marital Status		
Single	137	35.8
Married	246	64.2
Employment status		
Not working	170	44.4
Working	213	55.6
Education		
Primary school graduate	15	3.9
Middle school graduate	13	3.4
High school graduate	76	19.8
Undergraduate	228	59.5
Postgraduate	51	13.3
BMI Group (kg/m <sup>2</sup> )		
Underweight	36	9.4
Normal	217	56.7
Overweight	94	24.5
Obese	36	9.4
BMI <25 kg/m <sup>2</sup> (non-overweight)	253	66.1
BMI ≥25 kg/m <sup>2</sup> (overweight)	130	33.9

Note: BMI: Body Mass Index; SD: Standard Deviation.

Mean YFAS score of women with a BMI >25kg/m<sup>2</sup> was higher than those with a BMI <25kg/m<sup>2</sup> ( $p=0.001$ ). All classifications of food addiction in women with BMI >25kg/m<sup>2</sup> were higher than those with a BMI <25 kg/m<sup>2</sup> ( $p=0.012$ ) (Table 2).

**Table 2** – Distribution of Yale Food Addiction Scale and Beck Depression Inventory scores. Istanbul, 2020.

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	BMI <25 kg/m <sup>2</sup> **		BMI ≥25 kg/m <sup>2</sup> ***		Total (n=383)		p-value
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	Min-Max.	
BPS	145.42 (26.06)	142.20-148.65	141.15 (27.10)	136.45-145.86	143.97 (26.46)	141.32-146.63	0.102 <sup>a</sup>
BDI	15.77 (11.83)	14.30-17.23	15.18 (11.09)	13.26- 17.11	15.57 (11.57)	14.41-16.73	0.679 <sup>a</sup>
YFAS	1.40 (1.82)	1.17-1.62	2.00 (2.02)	1.65- 2.35	1.60 (1.91)	1.41-1.79	0.001 <sup>a</sup>
	n	%	n	%	n	%	
The Yale Food Addiction Scale							
None	192	75.9	89	68.5	281	73.4	0.012*
Mild	37	14.6	23	17.7	60	15.7	
Moderate	24	9.5	13	10.0	37	9.7	
Severe	-	-	5	3.8	5	1.3	

**Table 2** – Distribution of Yale Food Addiction Scale and Beck Depression Inventory scores. Istanbul, 2020.

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	BMI <25 kg/m <sup>2</sup> **		BMI ≥25 kg/m <sup>2</sup> ***		Total (n=383)		p-value
	Mean (SD)	95% CI	Mean (SD)	95% CI	Mean (SD)	Min-Max.	
Beck Depression Inventory							
Normal	99	39.1	53	40.8	152	39.7	0.893*
Mild depression	60	23.7	31	23.8	91	23.8	
Borderline clinical depression	26	10.3	15	11.5	41	10.7	
Moderate depression	35	13.8	14	10.8	49	12.8	
Severe depression	21	8.3	13	10.0	34	8.9	
Very serious depression	12	4.7	4	3.1	16	4.2	

Note: \*Chi-Square ( $p < 0.05$ ); \*\*Non-overweight ( $n=253$ ); \*\*\*Overweight ( $n=130$ ); <sup>a</sup>Mann Whitney U. BDI: Beck Depression Inventory; BMI: Body Mass Index; BPS: Body Perception Scale; SD: Standard Deviation; YFAS: The Yale Food Addiction Scale.

The YFAS scores of the women showed significant positive correlations with body weight, BMI, and BDI scores, and significant negative correlations with the BPS ( $P_{\text{weight}}, P^{\text{BMI}}, P_{\text{beck}} = 0.000, P_{\text{BPS}} = 0.001$ ). Increase in the level of food addiction consequently decreases body perception, thereby increasing the level of body dissatisfaction (Table 3).

**Table 3** – Relationship between scales' scores and informations. Istanbul, 2020.

Variables	YFAS		BPS		BDI	
	r	p-value	r	p-value	r*	p-value
Age (year)	0.028	0.586	-0.024	0.643	-0.144	0.005
Body weight (kg)	0.205	0.000	-0.079	0.121	-0.014	0.785
BMI (kg/m <sup>2</sup> )	0.187	0.000	-0.114	0.026	-0.028	0.589
BDI	0.341	0.000	-0.230	0.000	1	-
BPS	-0.165	0.001	1	-	-0.230	0.000

Note: \*r: Spearman Correlation. BDI: Beck Depression Inventory; BPS: Body Perception Scale; YFAS: The Yale Food Addiction Scale.

Employment and educational status did not appear to influence BMI and body weight. However, the BDI and BMI scores are affected by marital status. Considering the variables presumed to influence the YFAS score, we created a model according to BDI, BMI, age, BPS, and marital status. Furthermore, our study outcomes indicated that the YFAS score was affected by the BDI and BMI scores. Increase in the BDI and BMI scores subsequently increased the YFAS score by 0.054 and 0.076 units, respectively. BDI, BMI, age, BPS, and marital status accounted for 15.1% of the YFAS score. ( $p < 0.001$ ) (Table 4). This shows that the factors affecting food addiction are explained significantly.

**Table 4** – The effect of some variables on eating attitude. Istanbul, 2020.

	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Standard Error	Beta		
Constant	-0.256	0.797		-0.321	0.748
BPS	-0.004	0.004	-0.057	-1.157	0.248
BDI	0.054	0.008	0.326	6.630	<0.001
Age	-0.005	0.011	-0.026	-0.409	0.683
BMI	0.076	0.022	0.187	3.512	<0.001
Marriage status	-0.220	0.239	-0.055	-0.920	0.358

Note: Dependent variable: YFAS score,  $R^2$ : 0.151,  $p < 0.001$ . BMI: Body Mass Index; BPS: Body Perception Scale; BDI: Beck Depression Inventory; YFAS: The Yale Food Addiction Scale.

## DISCUSSION

Studies have reported that the prevalence of food addiction in overweight and obese ( $\text{BMI} \geq 25 \text{ kg/m}^2$ ) individuals can rise to 56.8% [13,14]. A study reported that food addiction and depression rates are high in women with high BMI [15]. A study on depression and food addiction has reported that food addiction was more common in people diagnosed with depression and the BMI and hip circumference measurements of the group with high rates of food addiction were higher than the other groups [15]. A meta-analysis of 28 studies in 2014 in the United State has revealed that the prevalence of food addiction was higher in women than men (women; 12.2%, men; 6.4%). The same meta-analysis also reported that overweight/obese people have higher food addiction rates than those with a healthy BMI. ( $\text{BMI} \geq 25 \text{ kg/m}^2$ : 24.9%, and  $\text{BMI} < 25 \text{ kg/m}^2$ : 11.1%) [16].

According to the results of our study, we saw that we had similar results with the literature. We may say that the relationship between obesity and food addiction is common in worldwide. In most studies, food addiction has been associated with high BMI and depression. Current literature shows that food addiction is a multifactorial comorbidity, and this is directly related to obesity [17-20]. Accordingly, in a study conducted on whether food addiction is a phenotype of obesity, supporting data were obtained [21,22]. In our study, the results showed that body dissatisfaction increased with food addiction. So, we had a unique result. High BMI, high depression scale points and food addiction are affecting each other. By showing the other effective points to the food addiction, like age and marital status, we see that the food addiction components are explained well. This is the strength of our study.

Apart from the factors examined, it is imperative to note that there are several factors that trigger food addiction. For example, Prader-Willi Syndrome (PWS), a genetic disease that causes obesity. Patients with this condition typically present with food addiction [23]. For these and other conditions the primary cause of food addiction and its major effects on individuals should be investigated.

As a limitation of our study, we used BMI to assess the obesity. In future studies, it may be better to supporting the assessment of obesity status with waist / height ratio. Additionally, this study emphasizes the need for multidisciplinary, planned studies on food addiction.

## CONCLUSION

Our study was planned to elucidate various psychological and physiological factors specific to food addiction. Depression and overweight/obesity contribute to explain food addiction behaviour, therefore food addiction treatment should primarily include the treatment of depression and obesity. In this case, food addiction treatment should primarily include the treatment of depression and obesity. Studies on whether individuals with food addiction benefit from pharmacological treatments targeting dopamine or addiction systems are warranted.

## CONTRIBUTORS

Study conception and design: Burcu Yeşilkaya, Burcu Ates Ozcan; Data analysis and interpretation: Burcu Ates Ozcan, Burcu Yeşilkaya; Article review: Burcu Yeşilkaya; Approval of the final version: Burcu Yeşilkaya, Burcu Ates Ozcan.

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