

The impact of obesity and smoking on hedonic hunger: a cross-sectional study

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Abstract

Introduction: Hedonic hunger refers to the consumption of food for pleasure and is believed to be associated with the increase of obesity rates.

Aim of the research: The primary objective of this study is to examine the complex relationship between obesity and hedonic hunger, with a specific focus on comparing young adults with and without obesity.

Material and methods: A cross-sectional observational survey was conducted at the University of Health Sciences (UHS) Istanbul Prof. Dr. Cemil Taşcıoğlu City Hospital, following approval from the Clinical Research Ethics Committee. The study included 338 participants from the Family Medicine Outpatient Clinic. Sociodemographic characteristics were assessed through a 41-item questionnaire. Hedonic hunger was measured using the Power of Food Scale, and cigarette addiction was evaluated with the Fagerström Nicotine Dependence Test. Data were analysed using SPSS, with statistical significance set at $p \leq 0.05$.

Results: The mean age of participants was 32.8 ± 8.24 years. The mean body mass index was 27.99 ± 6.12 kg/m² for men and 29.51 ± 8.99 kg/m² for women. A total of 40.53% ($n = 137$) of participants were classified as obese. The mean Power of Food Scale score was 2.85 ± 0.9 , and the mean Fagerström Nicotine Dependence Test score was 4.13 ± 3.33 . Hedonic hunger levels were significantly higher in individuals with obesity ($p < 0.01$).

Conclusions: This study highlights elevated hedonic hunger levels among individuals with obesity.

Introduction

Obesity is widely recognised as a complex and multifactorial disease that exerts detrimental effects on health, ranking as the second leading cause of preventable deaths after smoking. It is characterised by an excessive accumulation of fat in the body due to high energy intake. The prevalence of obesity has exhibited a significant increase in recent years, as evidenced by the MONICA study conducted by the World Health Organisation across diverse regions of Asia, Africa, and Europe over a 12-year period [1]. This study revealed a remarkable 10–30% surge in obesity prevalence during the last decade. Furthermore, a comprehensive investigation conducted by the Center for Chronic Diseases Prevention and Control (CDC) and NHANES (National Health and Nutrition Examination Survey) in the United States, where obesity is particularly prevalent, indicates a progressive rise in obesity rates among individuals aged 20–39 years. Notably, between 1988 and 1994, the prevalence of obesity stood at 17.7%, while by 2018, this rate had escalated to 40%. This upward trend in obesity rates was observed both among women (from 20.7% to 39.7%) and men (from 14.8% to 40.3%) [2].

Smoking addiction stands as the foremost preventable cause of mortality on a global scale. The 2000s witnessed a pinnacle in the cumulative risks of the past, resulting in the loss of 5.4 million lives annually. Without expeditious intervention, projections indicate that by 2030, smoking-related deaths will surpass the daunting figure of 8 million per year, with 80% of these occurrences concentrated in developing nations. Disturbingly, unless proactive measures are implemented to address smoking addiction, it is estimated that one billion individuals will succumb to its consequences throughout the course of the 21st century [3].

Nicotine emerges as the primary addictive agent found in tobacco and its derivatives [4]. Through its binding to nicotinic cholinergic receptors (nAChR) situated on dopaminergic neurons within the ventral tegmental area, dopamine release from the nucleus accumbens is triggered. This phenomenon elicits pleasurable sensations and appetite suppression, thus generating nicotine-induced reward and reinforcing positive outcomes [5].

Hedonic hunger is characterised as a form of appetite that arises from the sensory properties of food, such as taste, smell, and other sensory stimuli, as well as the pleasurable experience derived from food con-

sumption, independent of biological necessity [6]. In addition to homeostatic hunger, hedonic eating mechanisms play a significant role in food intake, particularly in response to constant exposure to delectable food. This type of eating is referred to as hedonic eating and is closely associated with rewarding, emotional, and cognitive factors [7]. The act of eating entails a combination of pleasure and reward mechanisms, mediated by the cortico-limbic pathway within the brain [8]. The dopaminergic reward pathways, including the nucleus accumbens and the caudate nucleus, govern motivation and expectation. Studies have demonstrated the involvement of opioid signals in the shell of the nucleus accumbens in the hedonic hunger “liking” process, ultimately influencing dopamine motivation [7]. Hedonic eating leads to a loss of control over pleasurable foods, consequently triggering short-term weight gain [9]. Food preferences in obese individuals are generally driven by the reward value of the food rather than homeostatic regulation mechanisms [10].

Material and methods

Participants aged 18 to 45 years, who visited the Family Medicine Outpatient Clinics at the University of Health Sciences and gave voluntary informed consent, were included in the study. Based on annual data showing 12,147 patient visits, and using a 95% confidence interval with an 80% study power, the required sample size was calculated as 305. Using a convenience sampling method, 338 participants with normal weight, overweight, obesity, and morbid obesity within the 18–45 age group were selected. Individuals who were outside the 18–45 age range, had undergone bariatric and/or reconstructive surgery or were pregnant were excluded.

Participants were asked about sociodemographic characteristics, eating habits, body mass index, smoking, alcohol use, substance use, stress coping methods, breastfeeding history, childhood experiences, and satisfaction with their current weight. Nicotine dependence was measured using the Fagerström Test for Nicotine Dependence (FTND), developed by Dr. Karl Fagerström in 1989. A Turkish study by Uysal *et al.* confirmed that the test has moderate reliability [11]. The FTND score ranges from 0 to 10 and indicates different levels of dependence: very low (0 to 2 points), low (3 to 4 points), moderate (5 points), high (6 to 7 points), and very high (8 to 10 points). To assess hedonic hunger, the Power of Food Scale (PFS) was used. Originally developed by Cappelleri *et al.* as a 21-item tool, the scale was adapted into Turkish in 2020 by Ülker *et al.*, resulting in a 15-item version [12]. Each item is rated on a 5-point scale from 1 to 5. Scores above 2.5 indicate increased hedonic hunger. Higher scores reflect a greater psychological response to food cues and greater sensitivity to the food environment.

Statistical analysis

Data were analysed using SPSS version 25 (Statistical Package for the Social Sciences). The Kolmogorov-Smirnov test was used to assess normality. Descriptive statistics for continuous variables included minimum, maximum, mean, median, and standard deviation. Categorical variables were presented as frequencies and percentages. The Mann-Whitney *U* test was used to compare numerical data between two independent groups. Categorical data were analysed using Pearson's χ^2 and Fisher's exact tests. The relationship between FTND and PFS scores was evaluated using Spearman correlation analysis. A *p*-value of ≤ 0.05 was considered statistically significant.

Results

The mean age of the participants was 32.8 ± 8.24 years, ranging from 18 to 45 years. The mean weight was 82.31 ± 23.47 kg, and the mean height was 1.69 ± 0.01 m. The calculated mean body mass index (BMI) was 28.87 ± 7.94 kg/m². When the obesity distribution by gender was examined, 35.21% of men ($N = 50$) and 44.39% of women ($N = 87$) were classified as obese. However, the relationship between gender and obesity status was not statistically significant ($p > 0.05$).

The sociodemographic characteristics of the participants are presented in Table 1. Figure 1 shows the distribution of FTND scores and levels of nicotine dependence.

The mean PFS score of the participants was 2.85 ± 0.9 , and the mean FTND score was 4.13 ± 3.33 . Hedonic hunger was significantly more frequent among participants with a master's degree or higher compared to those who had only completed high school ($p < 0.05$). Additionally, the frequency of hedonic hunger was significantly higher in obese participants ($p < 0.01$). Obese individuals had significantly higher PFS scores compared to underweight and normal-weight individuals ($p < 0.05$).

Hedonic hunger was also significantly more common among participants who were dissatisfied with their current weight ($p < 0.01$). Among these participants, those who were dissatisfied had a higher frequency of obesity and a lower frequency of being underweight or normal weight. This difference between groups was statistically significant ($p < 0.01$).

No statistically significant relationship was found between BMI, PFS classification, smoking status, and duration of breastfeeding ($p > 0.05$) (Table 2). However, the frequency of hedonic hunger was significantly higher in participants who reported eating sweets as a way of coping with stress ($p < 0.01$). Smokers who used smoking to cope with stress had significantly higher FTND total scores compared to non-smokers ($p < 0.01$). There was no statistically significant correlation between FTND items or total scores and PFS scores ($p > 0.05$).

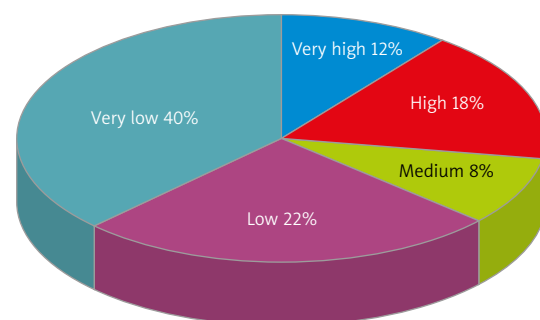
Table 1. Sociodemographic factors of the participants

Parameter		N	%
Age group	Under 33 years	178	52.66
	33 and above	160	47.34
Gender	Male	142	42.01
	Female	196	57.99
Obesity status	Not obese	201	59.47
	Obese	137	40.53
Marital status	Single	145	42.90
	Married	193	57.10
Education level	Elementary school or below	62	18.34
	High school	64	18.93
	University	160	47.34
	Master's degree or doctorate	52	15.38
Job Status	Student	42	12.46
	Housewife	57	16.91
	Civil service	67	19.88
	Blue-collar worker	63	18.69
	Self-employed	31	9.20
	Retired	16	4.75
	Unemployed	11	3.26
	Others	50	14.84
Economical status	Income less than expenses	82	24.33
	Income equal to expenses	144	42.73
	Income more than expenses	111	32.94

Discussion

In our study, obesity was more common among individuals who were dissatisfied with their current weight compared to those who were satisfied. These individuals also had a lower frequency of being underweight or within a normal weight range. Additionally, higher levels of hedonic hunger were observed in this group, and the differences between groups were statistically significant. A study by Sujoldzić *et al.*, which included 1934 adolescents from different cultural backgrounds, found a strong association between BMI, weight dissatisfaction, and psychosocial well-being [13]. Similarly, a study by Uçar conducted with 230 high school students in Ankara examined the relationship between hedonic hunger, food awareness, and nutritional status. It showed a stronger correlation between hedonic hunger and body weight dissatisfaction among female students, with statistical significance for both genders. The results suggested that this difference may stem from the greater importance female students place on body image [14].

In our study, no significant correlation was found between food neophobia, total scores, body dissatis-

**Figure 1.** The participants' status of tobacco dependence

faction, and hedonic hunger. Likewise, there was no statistically significant difference in hedonic hunger between current and former smokers. However, among non-smokers, those with obesity showed significantly higher hedonic hunger levels compared to non-obese smokers. A study by Sarahman that examined factors influencing hedonic hunger in adults reported that 33.7% of those with hedonic hunger were smokers and 66.3% were non-smokers [15]. Donny *et al.* discussed the reinforcing and appetite-related

Table 2. The relationship between breastfeeding time, obesity, hedonic hunger, and smoking

Variable		Duration of breastfeeding in childhood								P-value
		0–6 month		6–12 months		12–18 months		> 18 months		
		N	%	N	%	N	%	N	%	
Body mass index classification	Underweight	6	6.25	5	6.41	3	9.09	7	11.48	ª0.993
	Healthy weight	35	36.46	28	35.90	11	33.33	20	32.79	
	Overweight	22	22.92	19	24.36	8	24.24	14	22.95	
	Obese	33	34.38	26	33.33	11	33.33	20	32.79	
Power of Food Scale	Hedonic hunger is present	32	33.33	25	32.05	9	27.27	23	37.70	ª0.770
	Hedonic hunger is not present	64	66.67	53	67.95	24	72.73	38	62.30	
Smoking status	None	45	46.88	36	46.15	17	51.52	32	52.46	ª0.992
	Old smoker	7	7.29	6	7.69	2	6.06	4	6.56	
	Sometimes smoking	9	9.38	9	11.54	2	6.06	7	11.48	
	Regular smoker	35	36.46	27	34.62	12	36.36	18	29.51	

* χ^2 test.

effects of nicotine, showing that smokers often have lower body weight than non-smokers and tend to gain weight after quitting. Both animal and human studies suggest that nicotine enhances food reinforcement, and these effects may be more pronounced after quitting smoking, as nicotine's appetite-suppressing effects diminish [16]. However, no study has clearly defined the effect of smoking addiction on hedonic hunger. Considering that obesity contributes to hedonic hunger and smoking suppresses appetite, it was expected that our study would find higher hedonic hunger in non-smoking individuals with obesity compared to non-obese smokers.

The comparison of breastfeeding duration with BMI, body dissatisfaction, and smoking showed no significant relationships ($p > 0.05$). In general, breastfeeding is known to protect against obesity and chronic diseases, strengthen the immune system, and support mental and physical development [17]. In terms of psychosexual development, the first 1.5 years are considered the oral phase. Inadequate or excessive satisfaction of oral needs during this stage may lead to traits such as dependency, passivity, or self-centeredness. In later life, the mouth may remain a source of gratification, potentially resulting in behaviours like overeating, smoking, or nail-biting [18]. A longitudinal study by Dubois *et al.* that tracked 2103 children born in Canada in 1998 for 4.5 years found that not being breastfed in the first 3 months and having obese parents were significant risk factors for childhood obesity [19]. Similarly, a study by Öztora *et al.* found no significant relationship between breastfeeding duration and obesity among primary school children [20]. A study of 2524 participants in Kastamonu also found no association between breast-

feeding duration and obesity [21]. Notably, there is no available research comparing childhood breastfeeding duration with hedonic hunger status.

Our study also found no significant relationship between breastfeeding and body dissatisfaction. Still, given the potential influence of breastfeeding on the oral phase and its link to behaviours like overeating and addiction, a connection between these factors is plausible. However, hedonic hunger is shaped by various influences.

Participants who reported eating sweets to cope with stress had significantly higher hedonic hunger levels ($p < 0.01$). In a study by Cameron *et al.* that involved 15 individuals, pleasure from food increased after a 24-hour fast, particularly for snacks and sweets, indicating intensified hedonic hunger [22]. A study by Aydoğdu *et al.* from Gazi University revealed that carbohydrates like glucose, fructose, and sucrose activate the hedonic system [23]. In another study examining weight-based teasing and emotional well-being in 1491 adolescents, emotional states like sadness and boredom were linked to emotional eating, with women being more affected by emotional triggers, leading to increased food cravings [24]. These findings suggest that stress affects eating behaviours and may lead to hedonic overeating. Uçar's study also found a weak correlation between body dissatisfaction and food cravings under stress, especially in girls, although the results were not statistically significant for either gender [14]. Another study conducted with 171 adults in South Australia on mindfulness and eating behaviour found that those with higher food awareness ate less in response to emotions such as sadness and stress. As food awareness increased, the consumption of high-energy foods like ice cream decreased [25].

Conclusions

The study revealed that individuals with obesity who were dissatisfied with their weight and consumed sugary foods due to stress had higher levels of hedonic hunger. These findings highlight the importance of addressing both hedonic and homeostatic mechanisms in obesity treatment, particularly by tailoring interventions for those with high hedonic hunger.

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Ethical approval

This study was approved by the Clinical Research Ethics Committee of the University of Health Sciences (UHS) Istanbul Prof. Dr. Cemil Taşcıoğlu City Hospital, under academic committee decision number 246, dated 5 September 2022.

Conflict of interest

The authors declare no conflict of interest.

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