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The Effects of Depression and Impulsivity on Obesity and Binge Eating Disorder

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ABSTRACT:

The effects of depression and impulsivity on obesity and binge eating disorder

Objective: The aim of study was to evaluate depression and impulsivity in obese people with binge eating disorder (BED).

Method: The study included 149 obese study participants who were compared to 151 non-obese healthy controls. They were assessed with the Structured Clinical Interview (SCID-I), Eating Attitudes Test (EAT), Beck Depression Inventory (BDI), and Barratt Impulsiveness Scale-11 (BIS-11).

Results: The prevalence of BED was 47.6% in the obese study participants. Obesity with BED was more common in female participants. Depressive disorder was detected in 41.2% of the obese subjects. There was no significant difference between BED (+) and BED (-) groups with respect to depressive disorder ($p>0.05$). The cognitive impulsivity and non-planning activity scores of the depressive group were significantly higher than for the participants without depression ($p<0.05$). The cognitive impulsivity scores of depressive obese participants were significantly higher than for obese participants without depression ($p<0.05$).

Conclusion: Obesity appears to be associated with depression rather than impulsivity. Impulsivity was found in obese people with binge-eating specifically. This study suggests that depression and/or binge eating may be mediating factors for the outcome of obesity.

Keywords: binge eating disorder, depression, impulsivity, obesity

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INTRODUCTION

The incidence of obesity has increased dramatically in the past few decades. In addition to a genetic tendency, social, cultural, emotional and diet-related factors also play important roles in the development of obesity[1]. Obesity is a chronic disorder and it is associated with several medical comorbidities (i.e., diabetes mellitus, hypertension, heart disease, etc.)[2].

There is also a high comorbidity rate between obesity and psychiatric disorders. In particular, depression and obesity association is well described in the literature[3-5]. Moreover, patients with personality disorder, substance abuse history, and attention deficit hyperactivity disorder (ADHD) are reported to have a higher prevalence of obesity[6-8]. Although obesity is not categorized in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), characteristics related to eating disorders such as body dissatisfaction and low self-esteem, perfectionism, impulsivity, and disinhibition have been observed in obese patients.[9-11]

Two distinct and specific subgroups of obese people have been proposed: obese binge eaters

and non-binge eaters[12,13]. Binge eating disorder (BED) is a psychiatric disorder characterized by episodic uncontrolled consumption of large amounts of food in the absence of the inappropriate compensatory methods that characterize bulimia nervosa. This eating disorder has been given provisional status by being included in the Appendix of the DSM-IV and it is included as an example of eating disorders not otherwise specified (EDNOS)[14]. BED is the most common eating disorder found in obese people. The prevalence of BED ranges from approximately 0.3 to 7% in community samples to between 9% and 30% in obesity clinics[15-17].

Most studies have found significantly higher levels of eating related and general psychiatric symptomatology in obese patients with binge eating than those without binge eating[18, 19]. There appears to be a positive relationship between binge eating and depressive symptoms and a lifetime history of affective disorders in those samples recruited for treatment trials and, to a lesser degree, in non-treatment seeking samples of obese BED subjects[5, 18-20]. Furthermore, factors such as obsessiveness-compulsivity, interpersonal sensitivity, paranoid ideas, and psychoticism seem to be strongly linked to BED severity[4].

Impulsivity is a trait common to several psychiatric disorders and it is associated with mood instability, behavioral problems, and action without planning[21-23]. Increased impulsivity levels are reported in all types of mood episodes[22, 24]. Some studies indicate a biological relationship between depression and impulsivity[25]. Cremniter et al. have reported a correlation between impulsivity and low levels of 5HIAA (5-hydroxy indoleacetic acid) in a sample of suicide attempters[26]. The association between eating disorders and impulsivity has been documented widely in the literature[27,28]. Impulse control disorders have also been reported to be common in eating disorders[21]. Attention deficit and hyperactivity disorder (ADHD) is characterized by impulsivity. Many existing investigations present the comorbidity of childhood obesity with ADHD [7,29]. Some studies have suggested that obese people were more impulsive, unlike other overeaters. Increased impulsivity might make it more difficult for them to resist the temptation of carbohydrate rich foods[30].

The aim of this study was to investigate depression and impulsivity in obese subjects compared to non-obese healthy controls. In order to determine that obese binge eaters and non-binge eaters are two distinct subgroups, we also wanted to test the hypothesis that depression and impulsivity were more frequent in BED.

MATERIALS and METHODS

Participants

This study was performed in two centers: Kahramanmaraş Sütçü Imam University and Konya Numune Hospital. The study protocol was approved by the Local Ethics Committee of Kahramanmaraş Sütçü Imam University. Patients who applied to outpatient clinics of the internal medicine department for obesity for the first time were included in the study. Written informed consents of the contributors were obtained. Obese participants (n=149) between the ages of 18-65 years and with an educational achievement of at least elementary school were included. The first and second authors interviewed all the participants. Patients with systemic disorders, severe renal or liver failure, serious endocrinological disorders (overt hypothyroidism, Cushing syndrome, etc.), history of bariatric surgery, cancer diagnosis, schizophrenia or related psychotic disorder, cognitive disorders or dementia were excluded.

An age and gender-matched control group (n=151) was recruited from employees at Konya Numune Hospital.

Anthropometric Measurements

Body Mass Index (BMI) was calculated as the ratio of weight in kilograms to square of height in meters (kg/m2). The participants were divided into groups based on their BMI as ≤18 lean, 18.1-

24.9 normal, 25-29.9 overweight, 30-39.9 obese, ≥40 morbidly obese[31]. When we took into account the variability of BMI and weight gain or loss; it was decided to include subjects with a BMI of 28.5-42.5. The control group was formed from subjects with a BMI of 18.1-24.9 who were non-psychiatric healthy individuals.

Social and Demographic Factors

Initially, we examined all participants using a socio-demographic questionnaire. The educational level was rated as the total number of years of formal education completed by each participant. The marital status of individuals was rated as either married (living with someone) or unmarried (living alone). Household income was rated against the minimum wage in Turkey, which roughly corresponds to 330 Euros per month.

Psychological Measures

The mood disorder and eating disorder modules of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I) were applied to all participants. The SCID-I was developed by First et al.[32]. The Turkish version of the SCID I used in this study was validated in the Turkish population in 1999[33]. A current diagnosis of major depression and BED was based on the SCID-I. The severity of depressive symptoms was assessed using the Beck Depression Inventory (BDI). The Turkish version of the BDI used in this study has been validated in a Turkish sample[34].

Eating attitudes were measured using the Eating Attitudes Test (EAT). This instrument measures the meal-related behavior and attitude of patients with eating disorders as well as measuring possible disorders in the eating behavior of normal individuals. This self-administered questionnaire is a Likert-type scale with 6 degrees and 40 items. The total points directly relate to the level of psychopathology. This instrument was developed by Garner and Garfinkel for screening eating disorders in adolescents older than 11 years[35]. The Turkish version of EAT was validated by Erol and Savaşır [36]. The cutoff point was suggested to be 30 points for Impaired Eating Behavior.

Impulsivity was measured using the Barratt Impulsiveness Scale version 11 (BIS-11)[37]. It is a self-report questionnaire based on a three-factor impulsivity model including both motor and cognitive impulsivity. The BIS-11 includes 30 items grouped into three subscales: attentional (inattention and cognitive instability), motor (motor impulsiveness and lack of perseverance), and non-planning (lack of self-control and intolerance of cognitive complexity). The evaluation of the BIS-11 gives four different sub-scores: total score, non-planning activity, attentional (cognitive) impulsivity and motor impulsivity. The Turkish version of the BIS-11 has been found to be valid and reliable, presenting similar psychometric properties to the original version of the BIS-11[38].

Statistical Analysis

Statistical analysis of the data was performed with SPSS version 15.0. The normality of the tests was analyzed with Kolmogorow-Smirnov, and all of the parameters distributed parametrically. Fischer exact, chi square, independent samples t test and one way ANOVA tests with post hoc Bonferroni correction were used. Multivariate logistic regression analysis was performed and independent predictors of obesity were determined. Statistical significance was assumed at $p<0.05$.

RESULTS

One hundred and forty-nine obese subjects were divided into two groups according to the DSM-IV criteria for diagnosis of binge eating disorder (BED). The percentage of obese subjects with BED was 47.6%. Seventy-one subjects had BED [BED (+)] (52 female, 19 male) and 78 subjects had no BED [BED (-)] (63 female, 15 male). The control group was formed from 151 individuals who had no psychiatric disorder.

Table 1: Demographic and clinical features of obese groups with and without binge eating disorder and the control group

	BED (+) n (%)	BED (-) n (%)	Control n (%)	Total n (%)	p
Gender					
Female	52 (25.9)	63 (31.3)	86 (42.8)	201 (100.0)	0.001
Male	19 (19.2)	15 (15.2)	65 (65.7)	99 (100.0)	
Education					
Elementary School*	36 (31.9)	49 (43.4)	28 (24.8)	113 (100.0)	<0.001
High School	12 (14.0)	14 (16.3)	60 (69.8)	86 (100.0)	
University	23 (22.8)	15 (14.9)	63 (62.4)	101 (100.0)	
Marital Status					
Married	54 (27.0)	57 (28.5)	89 (44.5)	200 (100.0)	0.015
Single	17 (17.0)	21 (21.0)	62 (62.0)	100 (100.0)	
Employment status					
Employed	27 (19.6)	21 (15.2)	90 (65.2)	138 (100.0)	<0.001
Unemployed	44 (27.2)	57 (35.2)	61 (37.7)	162 (100.0)	
Economic status					
Low economic status	15 (38.5)	8 (20.5)	16 (41.0)	39 (100.0)	0.227
Medium economic status	52 (21.6)	66 (27.4)	123 (51.0)	241 (100.0)	
Good economic status	4 (20.0)	4 (20.0)	12 (60.0)	20 (100.0)	
History of Childhood obesity					
Present	15 (53.6)	6 (21.4)	7 (25.0)	28 (100.0)	<0.001
Absent	56 (20.6)	72 (26.5)	144 (52.9)	272 (100.0)	
History of Adolescent obesity					
Present	21 (46.7)	14 (31.1)	10 (22.2)	45 (100.0)	<0.001
Absent	50 (19.6)	64 (25.1)	141 (55.3)	255 (100.0)	
Previous psychiatric history					
Present	16 (35.6)	16 (35.6)	13 (28.9)	45 (100.0)	0.007
Absent	55 (21.6)	62 (24.3)	138 (54.1)	255 (100.0)	
Lifetime suicide attempt					
Present	5 (55.6)	3 (33.3)	1 (11.1)	9 (100.0)	0.019
Absent	66 (22.7)	75 (25.8)	150 (51.5)	291 (100.0)	
Total	71 (23.7)	78 (26.0)	151 (50.3)	300 (100.0)	

BED (+)= obesity with BED, BED (-)= obesity without BED, Control= control group.
*: Significance was related with this variable.

The BED (+) and BED (-) obese groups were compared with the control group for socio-demographic characteristics (Table 1). Obesity and BED prevalence was higher in female patients. The mean ages of the groups were 38.3±9.3, 38.6±11.9 and 35.3±10.7 years in the BED (+), BED (-) and control groups, respectively. There were no significant differences between age groups. Educational status was relatively poorer in the obese groups. Being married was more prevalent among obese subjects, and being employed was more prevalent among the control group. There were no significant differences between the BED (+) and BED (-) groups in terms of age, educational, marital, employment or socio-economic status ($p>0.05$).

A history of childhood and adolescent obesity was also more prevalent in the obese group. Moreover, a history of childhood obesity was significantly more prevalent in obese subjects with BED. There were no significant differences between the BED (+) and BED (-) groups for history of adolescent obesity, previous psychiatric history or lifetime suicide attempts. A history of admission to psychiatric clinics and of suicide attempts was more prevalent among the obese group.

Body mass index values of the obese group were significantly higher than for the controls ($p<0.05$). However there were no significant differences for BMI values between the BED (+) and BED (-) groups.

The eating attitude test and Beck depression inventory scores were significantly higher in the obese group compared to the controls ($p<0.05$). The BED (+) group had higher scores of total impulsivity and unplanned activity compared to the BED (-) and control groups ($p>0.05$). BMI, EAT and impulsivity scores are presented in Table 2.

Table 2: Body Mass Index, Eating Attitudes Test, Beck Depression and Barratt Impulsiveness Scale Scores of obese groups with and without binge eating disorder and the control group

	BED(+) Mean±SD	BED(-) Mean±SD	Control Mean±SD	p
BMI (kg/m^2)	33.3±4.1	33.4±5.7	22.2±2.1*	<0.001
EAT score	27.6±12.3	25.5±12.7	7.2±7.8*	<0.001
BDI score	16.2±9.3	14.4±10.5	6.9±75.2*	<0.001
BIS-Total	67.5±10.8**	59.9±17.9	60.0±16.9	0.003
BIS-NPA	26.6±4.1***	25.3±5.1	24.1±5.1	0.002
BIS-CI	20.6±7.0	23.2±16.4	22.2±12.7	0.475
BIS-MI	21.8±3.7	21.6±4.0	20.9±4.2	0.260

BMI= body mass index, EAT= Eating Attitudes Test, BDI= Beck Depression Inventory, BIS= Barratt Impulsiveness Scale, NPA= non-planning, CI= cognitive impulsivity, MI= motor impulsivity
* : Control versus BED (+) and control versus BED (-) groups.
**: BED (+) versus BED (-) and control groups
***: BED (+) versus control group

A total of 61 subjects out of 149 participants were diagnosed as having major depressive disorder according to the DSM-IV criteria. Out of the BED (+) group, 33 subjects (46.5%) were diagnosed as having major depressive disorder, and from the BED (-) group, 28 subjects (35.9%) were diagnosed as having major depressive disorder. There was no significant difference between the BED (+) and BED (-) groups for major depression.

Impulsivity scores were compared between the study participants with and without depression among the whole study group, involving all participants. The BIS-CI and BIS-NPA scores of the depressive group were significantly higher than for the subjects without depression ($p<0.05$). Similarly, when the obese group was segmented as obese with and without depressive disorder, the BIS-CI scores of the depressive obese participants were significantly higher than for the obese participants without depression ($p<0.05$). Impulsivity scores, according to the presence of depressive characteristics, are shown in Table 3 for the whole group and in Table 4 for the obese group.

Multivariate logistic regression analysis was performed and independent predictors of obesity were detected. Being female was an independent risk factor for obesity (OR=2.415, p=0.016). The presence of BED was also an independent strong predictor of obesity (OR=13.333, $p<0.001$). Every one-point increase in depression scores and EAT total scores resulted in 1.064 and 1.061 fold increased risks for obesity (OR=1.064, $p<0.001$; OR=1.061, $p<0.001$, respectively). A history of childhood obesity and impulsivity scores could not be shown to be independent risk factors for obesity, considering the insignificant results for these parameters. Multivariate-logistic regression analysis results are presented in Table 5.

DISCUSSION

The main finding of this study is that obesity appears to be associated with depression rather than impulsivity. Impulsivity was found in obese people with binge-eating specifically. In addition, being female and having BED increase the risk of obesity. However, impulsivity had no significant effect on obesity; in particular, cognitive impulsivity scores were determined to be significantly higher for depressive obese subjects than for non-depressive obese subjects. These findings suggest that more impulsive obese individuals might have depressive disorders. This also provides clues for the influences of each of these two characteristics on obesity. On the other hand, our study confirmed that levels of impulsivity scores were determined to be higher in the BED (+) group. We can suggest that impulsivity may be a prominent feature in obese subjects with BED. Contrary to our expectations, the rate of depression in BED (+) subjects was not higher.

Binge eating disorder is present to varying degrees in obesity. BED is often seen in women (65% female, 35% male) and it is more common

Table 3: Impulsivity scores of all participants with and without major depressive disorder

	All participants (n=300)		
	Major Depression (+) (n=61) Mean±SD	Major Depression (-) (n=239) Mean±SD	p*
BIS-NPA	26.4±4.1	24.7±5.1	0.018
BIS-MI	21.9±3.5	21.1±4.2	0.180
BIS-CI	27.2±17.9	20.6±10.5	<0.001
BIS -Total	61.9±19.9	61.9±14.9	0.997

*: independent samples t test

Table 4: Impulsivity scores of obese subjects with and without major depressive disorder

	Obese subjects (n=149)		
	Major Depression (+) (n=61) Mean±SD	Major Depression (-) (n=88) Mean±SD	p*
BIS-NPA	26.4±4.1	25.7±5.0	0.401
BIS-MI	21.9±3.5	21.5±4.1	0.519
BIS-CI	27.2±17.9	17.9±3.6	<0.001
BIS-Total	61.9±19.9	65.2±9.7	0.187

*: independent samples t test

Table 5: Results of multivariate-logistic regression analysis and independent predictors of obesity

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p
Gender			
Male	1.00		
Female	2.415	1.178-4.950	0.016
BED			
Absent	1.00		
Present	13.333	5.454-32.597	<0.001
History of childhood obesity			
Absent	1.00		
Present	1.629	0.502-5.292	0.417
Depression score	1.064	1.027-1.103	<0.001
Impulsivity score	1.008	0.990-1.027	0.380
EAT score	1.061	1.027-1.097	<0.001

Depression score: Beck Depression Inventory (BDI) total score
Impulsivity score: Barratt Impulsiveness Scale-11 (BIS-11) total score
EAT score: Eating Attitudes Test (EAT) total score

among overweight women seeking treatment than overweight women not seeking treatment[39]. In our study, most of the patients who were seeking treatment were women (77.1% female: 22.8% male). The prevalence of BED in obese study participants seems to be relatively high compared with previous reports[40].

In our study, the differences in socio-demographic characteristics between the obese and control groups can be explained as increasing body weight through aging and the sedentary lifestyle of these subjects. These differences were not observed between the BED (+) and BED (-) groups.

Obesity was more frequent in subjects with a history of childhood and adolescent obesity. This finding suggests that the tendency to becoming obese in the future might be high in individuals with childhood and adolescent obesity. In particular, the presence of childhood obesity was

more frequent in the BED (+) group. This suggests that obesity begins in early childhood. In addition, binge-eating behavior is a habit, which continues from this period of life. This impulsive eating behavior may be a sign of hyperactivity and should be considered in the treatment of childhood obesity[30,41].

There are reports related to obesity and comorbid psychiatric disorders[9]. In our study, a significant difference was determined in obese subjects for previous psychiatric history. Similarly, there are also reports claiming increased rates of suicide attempts in both obese individuals and those with an eating disorder[42]. Our results are in agreement with these reports.

In previous reports, the prevalence of psychiatric comorbidity was suggested to be higher in anorexia nervosa, bulimia nervosa and binge eating disorder. In particular, lifetime depressive characteristics were frequently seen in these disorders[43]. Moreover, it was concluded that depression caused recurrences in BED after treatment[39]. The coexistence of depression among BED (+) and BED (-) subjects was common in our study group. However, we did not find any significant difference between the BED (+) and BED (-) groups for the existence of depression.

It has been suggested in previous reports that obese individuals were more impulsive than lean ones, especially those with binge eating disorder who had higher impulsive characteristics[44, 5]. On the other hand, there was no relationship between impulsivity and distress related eating behavior in normal weight individuals[46]. In our study, significantly higher scores were determined in the total impulsivity score for the BED (+) group compared to the BED (-) and control groups. In addition, non-planning activity scores were significantly higher in the BED (+) group. These findings suggest that obese individuals with BED tended to present impulsivity characteristics and unplanned activities. It can be predicted that BED (+) obese individuals might have difficulties in adapting to diet programs.

Cognitive impulsivity scores were determined to be significantly higher in depressive obese subjects compared to non-depressive ones. When the whole study group was considered, similarly depressive obese subjects had higher cognitive impulsivity and non-planning activity scores. In research about depression and impulsivity, impulse control disorders (ICD) were frequently observed in depressive patients or vice versa[23,24,47]. In addition, there are reports that concluded that impulse control disorders were frequently seen in eating disorders[21,48]. The relationship between serotonin (5-HT) and ICD has been the subject of various investigations. ICD shares other common neurobiological markers of vulnerability, including norepinephrine and dopamine (DA) imbalance. In particular, the significant role of the 5-HT/DA interaction has been reported within the nucleus accumbens in the control of impulse control disorders[49]. Several lines of evidence have raised the possibility that serotonin pathways contribute to the pathophysiology of anorexia nervosa and bulimia nervosa[50]. All of these common neurobiological pathways may explain the coexistence of impulsivity with depression. It is difficult to conclude whether impulsivity leads to depression or vice versa. In order to clarify this, long prospective studies are needed. In our study, we showed that there was a relationship between depression and impulsivity. However, we could not show any relationship between obesity and impulsivity. We suggest that depression and/or binge eating might be the mediating factor for the outcome of obesity.

In this present study, the cross-sectional design restricts the interpretation of a causal association between depression and impulsivity on obesity and BED. In conclusion, despite some limitations, the present study suggests that obesity seems to be associated with depression rather than impulsivity. Impulsivity was significantly higher in depressive obese subjects than in non-depressive obese subjects. Furthermore, impulsivity may be a prominent feature in obese subjects with BED. Although clinical evaluation was performed, further studies with larger numbers of participants are needed involving Axis II disorders, alcohol and drug

abuse and impulse control disorders. However, these results should be confirmed by prospective studies. A psychiatric view is needed in research about the development and treatment of obesity. Understanding the psychopathology of obesity is critical for efficient therapeutic applications. Notwithstanding these limitations, the findings of our study provide suggestive evidence of the role of depression and impulsivity in obesity and binge eating disorder.

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