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Nighttime eating syndrome and its relationship with impulsivity in major depressive disorder

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Abstract

Aim: This study aims to investigate the frequency, clinical features, and role of Nighttime Eating Syndrome (NES) in patients with major depressive disorder (MDD).

Material and Methods: Patients experiencing depression who applied to the psychiatry outpatient clinic were included in this study. All participants completed structured questionnaires, including socio-demographic data form, Beck Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Night Eating Diagnostic Questionnaire (NEDQ), and Barratt Impulsiveness Scale (BIS).

Results: A total of 142 patients, consisting of 112 (78.9%) women and 30 men (21.1%), between ages 18-64 years were included in the study. Among patients with MDD, NES prevalence was 26.1%. No statistically significant correlation was found between NEDQ score and age, BMI, or disease onset age ($p>0.05$). There was a statistically significant positive correlation between NEDQ scores and BDI (r: 0.448, $p<0.001$), BAI (r: 0.351, $p<0.001$), BIS-total (r: 0.473, $p<0.001$), BIS-Attention (r: 0.351, $p<0.001$), BIS-Motor (r: 0.351, $p<0.001$) and BIS-Nonplanning (r: 0.451, $p<0.001$) scores. The number of smokers was statistically significantly higher among patients with NEDQ>30 compared to those with NEDQ<30 ($p<0.001$). BDI ($p=0.027$), BIS-Total ($p<0.001$), BIS-Attention ($p=0.013$), BIS-Motor ($p=0.002$), and BIS-Nonplanning scores were significantly higher ($p<0.001$) among patients with NEDQ>30 compared to patients with NEDQ<30.

Discussion: NES is commonly encountered in psychiatric outpatient clinics and is associated with major depression, impulse control disorder, and nicotine addiction. In addition, it could be said that impulsivity is more associated with NES than depression.

Keywords

Depressive Disorder; Eating Syndrome; Impulsive Behavior

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Introduction

Night Eating Syndrome (NES) is classified under "Other Specified Eating or Feeding Disorders" in DSM-V. NES is an eating disorder characterized by a delayed circadian pattern of food intake [1]. Allison et al. used a verified measurement tool to demonstrate the association between NES and evening hyperphagia, morning anorexia, and mental health and sleep disorders [1]. It is stated that NES may be clinically significant due to its relationship with obesity and its prevalence may increase with bodyweight [2]. It has been shown that obese individuals with NES had significantly more depressive symptoms and significantly lower self-respect compared to other obese individuals [2].

There are a very limited number of studies related to NES in psychiatric outpatients. NES prevalence has been reported as 12.4% among psychiatric outpatients, and 25% among a sampling consisting of overweight or obese patients with schizophrenia, bipolar disorder, and depression [3, 4]. Another study reported NES prevalence as 35.2% among major depressive patients and 19.2% among healthy participants [5]. While studies indicate that NES may be associated with psychiatric illness, especially depression, our knowledge on this subject is rather limited.

Impulsivity, with stable and similar components, is a complex multi-dimensional attribute that can lead to negative real-life consequences such as poor decision-making, suicide, and aggression, and has been shown to be associated with characteristics of major depression patients in varying degrees [6]. Impulsivity has been associated with bipolar disorder (BD) and major depressive disorder (MDD). It was shown to be significantly higher in euthymic BD, both during and between manic attacks and depressive BD, and in unipolar MD patients compared to healthy controls [7-8].

This study aims to investigate the frequency and clinical features of NES in MDD patients. We also aimed to determine whether or not impulsivity plays a mediating role in the development of NES, which is often accompanied by MDD.

Material and Methods

Study Sample

This cross-sectional study was conducted on a sample of patients consisting of MDD patients who applied to the Sakarya Yenikent State Hospital. Minitab 17.0 program was used to determine the sample size. The sample size was calculated according to similar studies (11.0%) based on 5% type I error and 95% working power, and the number of patients to be included in the study was found as 128. The research study was approved by the Sakarya University Non-Interventional Applications Ethics Committee (Approval No. 31.03.2020-715224473 / 050.01.04 / 166). Written informed consent was obtained from all participants of the study.

The first seven items of the questionnaire were related to sociodemographic characteristics, including age, gender, number of children, place of residence, employment status, age at disease onset, number of hospitalizations, number of relapses, suicide attempts, family history of psychiatric disease, smoking, alcohol, substance abuse, and body mass index (BMI). Depression Inventory (BDI), Beck Anxiety Inventory (BAI), Night Eating Diagnostic Questionnaire (NEDQ), and Barratt Impulsiveness Scale (BIS) were used for the rest of the questionnaire.

Inclusion criteria included diagnosis of MDD, and age between 18 and 65 years. Exclusion criteria included the presence of neurologic disease that may affect cognitive functions, cortisone use, additional eating disorder, additional psychiatric comorbidity, history of substance abuse, and benzodiazepine use.

Beck Depression Inventory (BDI): This self-report scale was developed by Beck et al. in 1961 to measure the changes in severity and level of depressive symptoms in adults [9]. Turkish validity-reliability study was conducted by Hisli et al. in 1988 [10]. The scale consists of 21 items, each item is a self-assessment statement scored from 0-3. Researchers reported that the inventory included two sub-factors, somatic and cognitive.

Beck Anxiety Inventory (BAI): This inventory was developed by Beck et al. in 1988 to measure anxiety symptoms [11]. Individuals are asked to mark the extent to which they have been affected by the anxiety symptoms listed in the inventory over the past week. The inventory is a four-point Likert scale consisting of 21 items (0 indicating "never" and the other three corresponding to severity). Turkish validity-reliability study of the scale was conducted by Ulusoy et al. [12]. The minimum score possible is 0 and the maximum score is 63. Cronbach's alpha value was found to be 0.89.

Night Eating Diagnostic Questionnaire (NEDQ): This 16-item measurement tool is used to screen NES symptoms related to nighttime eating, evening hyperphagia, morning anorexia, and mental health and sleep disorders [13]. The first nine questions of the questionnaire were completed by all participants. Participants who did not wake up at night or eat at night were instructed not to continue answering the rest of the questions. The total score ranges between 0-52 and ≥25, indicating that the patient has NES. Turkish validity-reliability study of the scale was conducted by Atasoy et al [14]. A higher score indicates increased symptoms of NES, while a score of >30 indicates the presence of NES.

Barratt Impulsiveness Scale-11-Short Form (BIS-11-SF): BIS-11-SF is a 15-item self-reporting questionnaire designed to measure impulsivity. It is comprised of three main factors: Attention Impulsivity (A), Motor Impulsivity (M), and Nonplanning (NP) [15]. In this study, the Turkish adaptation of BIS-11-SF was used to evaluate impulsivity [16].

Statistical Analysis

SPSS (Statistical Package for Social Sciences) program version 15.0 was used for statistical analysis of the data obtained from the study. Descriptive statistical methods (mean, standard deviation, median, minimum, maximum, frequency, percentage), as well as the Chi-square and Fisher's Exact test for categorical variables and the Mann Whitney-U test for continuous variables, were applied for comparisons between the two groups. Spearman correlation test was used for correlation analysis. The results were evaluated within a 95% confidence interval with a level of significance set to $p<0.05$.

Results

A total of 142 patients, including 112 (78.9%) women and 30 men (21.1%), aged between 18-64 years were included in the study. The mean age of the patients was 33.16 ± 10.84 (median 33) years and 57% (n:81) of the patients were married. Education levels were as follows: primary school in 26.1% (n: 37), high school in 29.6% (n: 42), associate degree in 5.6% (n: 8), and undergraduate in 38.7% (n: 55). In total, 40.1% (n: 57) of the participants were unemployed, 16.9% (n: 24) were students, and 43% (n: 61) were employed. Among the patients, 43% (n: 61) were smokers, and 19.7% (n: 28) drank alcohol. Mean BMI was 24.57 ± 4.20 (range: 15-40.2) kg/m2. Age at the time of disease onset ranged between 10 and 61 years of age, and the mean age at onset was 28.56 ± 9.37 (median: 26) years. A history of suicide attempts was present in 7.7% (n: 11) of the patients. The medication was used by 45.1% (n: 64) of the patients, the most common being SSRI (Table 1).

The mean BDI score was 23.26 ± 12.26 (median:23, range:1-58), the mean BAI score was 23.67 ± 15.32 (median: 21, range: 0-58), the mean BIS-Total score was 66 ± 12.78 (median: 65, range: 35-104), the mean BIS-A score was 17.90 ± 4.11 (median: 18, range: 8-27), the mean BIS-M score was 20.93 ± 5.55 (median: 20, range: 10-41), the mean BIS-NP was 27.27 ± 6.99 (median: 27, range: 12-74), and the mean NEDQ score was 21.38 ± 11.58 (median: 18, range: 4-50).

According to NEDQ scores, 73.9% (n: 105) of the patients were NEDQ<30 and 26.1% (n: 37) were classified as NEDQ>30.

There was no statistically significant correlation between NEDQ score and age, BMI, and age of onset of a disease (p>0.05). There was a weak statistically significant positive correlation between NEDQ scores and BDI (p<0.001), BAI (p<0.001), BIS-Total (p<0.001), BIS-Attention (p<0.001), BIS-Motor (p<0.001), and BIS-Nonplanning scores (p<0.001) (Table 2).

There was no statistically significant difference between patients with NEDQ<30 and NEDQ>30 in terms of age, gender, marital status, education level, employment, alcohol use, BMI, disease onset age, suicide attempts, drug use, types of drugs used, or mean BAI score (p>0.05). The number of smokers was statistically significantly higher among patients with NEDQ>30 compared to those with NEDQ<30 (p<0.001). BDI (p=0.027), BIS-Total (p<0.001), BIS-Attention (p=0.013), BIS-Motor (p=0.002), and BIS-Nonplanning scores were significantly higher (p<0.001) among patients with NEDQ>30 compared to patients with NEDQ<30 (Table 3).

There were 54 patients who scored 17 and below on the Beck Depression Scale. BIS-Total, BIS-Attention, BIS-Motor and BIS-Nonplanning scores were significantly higher among those with NEDQ>30 than those who had NEDQ<30 (p<0.001, p=0.024, p=0.007, p=0.002, respectively).

Discussion

In our study, the NES prevalence among patients with MDD was 26.1%. Patients with NES had significantly higher BDI, BAI, BIS total and attention, motor, and non-planning subscores. This indicates that NES is associated with depression, anxiety, and impulsivity. In addition, compared to patients with low NES, patients with high NES scores had significantly higher BDI, BIS total scores and attention, motor, and non-planning

Table 1. Sociodemographic and clinical features

	n/mean±SD	%
Age (years)	33.16 ± 10.84	
Gender		
Female	112	78.9
Male	30	21.1
Marital status		
Single	61	43.0
Married	81	57.0
Education level		
Primary	37	26.1
High-school	42	29.6
Associate	8	5.6
Undergraduate	55	38.7
Employment		
Unemployed	57	40.1
Student	24	16.9
Employed	61	43.0
Smoking		
Smoker	61	43.0
Non-smoker	81	57.0
Alcohol use		
Yes	28	19.7
No	114	80.3
BMI (kg/m2)	24.57 ± 4.20	
Age at disease onset (years)	28.56 ± 9.37	
Suicide Attempt		
Yes	11	7.7
No	131	92.3
Drug use		
Yes	64	45.1
No	78	54.9
Drug Type		
SSRI	43	66.2
SNRI	12	18.5
TCA	3	4.6
Antipsychotic	4	6.2
Combined	3	4.6

BMI: Body mass index, SSRI: Selective serotonin reuptake inhibitors, SNRI: Serotonin-norepinephrine reuptake inhibitors, TCA: Tricyclic antidepressants.

Table 2. Correlation between Night Eating Diagnostic Questionnaire (NEDQ) scores and Barratt Impulsiveness Scale (BIS) scores

NEDQ	r	p
Age	-0.092	0.275
BMI	0.091	0.284
Disease onset age	-0.155	0.066
BDI	0.448	<0.001
BAI	0.351	<0.001
BIS-Total	0.473	<0.001
BIS-Attention	0.351	<0.001
BIS-Motor	0.351	<0.001
BIS-Nonplanning	0.451	<0.001

BMI: Body mass index, BDI: Beck Depression Inventory, BAI: Beck Anxiety Inventory

Table 3. Sociodemographic and clinical features according to Night Eating Diagnostic Questionnaire (NEDQ) scores

	NEDQ <30		NEDQ >30		p
	n/mean	%/SD	n/mean	%/SD	
Age (years)	33.37	11.14	32.57	10.08	0.764
Gender					
Female	84	80.0	28	75.7	0.580
Male	21	20.0	9	24.3	
Marital status					
Single	44	41.9	17	45.9	0.669
Married	61	58.1	20	54.1	
Education level					
Primary	29	27.6	8	21.6	
High-school	28	26.7	14	37.8	0.511
Associate	7	6.7	1	2.7	
Undergraduate	41	39.0	14	37.8	
Employment					
Unemployed	44	41.9	13	35.1	0.479
Student	19	18.1	5	13.5	
Employed	42	40.0	19	51.4	
Smoking					
Smoker	36	34.2	25	67.6	<0.001
Non-smoker	69	65.7	12	32.4	
Alcohol use					
Yes	19	18.1	9	24.3	0.413
No	86	81.9	28	75.7	
BMI (kg/m2)	24.39	4.45	25.08	3.40	0.213
Age at disease onset (years)	29.21	9.51	26.70	8.80	0.262
Suicide Attempt					
Yes	6	5.7	5	13.5	0.155
No	99	94.3	32	86.5	
Drug use					
Yes	46	43.8	18	48.6	0.611
No	59	56.2	19	51.4	
Drug Type					
SSRI	30	65.2	13	68.4	
SNRI	8	17.4	4	21.1	0.954
TCA	3	6.5	0	0.0	
Antipsychotic	3	6.5	1	5.3	
Combined	2	4.3	1	5.3	
BDI	21.93	12.05	27.03	12.20	0.027
BAI	22.87	14.59	25.95	17.25	0.427
BIS-Total	63.41	11.98	73.35	12.23	<0.001
BIS-Attention	17.38	3.95	19.38	4.23	0.013
BIS-Motor	20.06	5.06	23.41	6.18	0.002
BIS-Nonplanning	26.20	7.33	30.30	4.81	<0.001

BMI: Body mass index, SSRI: Selective serotonin reuptake inhibitors, SNRI: Serotonin-norepinephrine reuptake inhibitors, TCA: Tricyclic antidepressants. BDI: Beck Depression Inventory, BAI: Beck Anxiety Inventory, BIS: Barratt Impulsiveness Scale.

subscores, indicating that patients with NES have an increased severity of depression and increased impulsivity. Furthermore, impulsivity was significantly higher in NES patients diagnosed with depressive disorder and with high BDI score. Therefore, it could be said that impulsivity is more associated with NES than depression. There was also an increased rate of smoking among patients with NES.

In our study, the NES prevalence was 26.1% among patients with MDD. The prevalence of NES (26.1%) according to NEDQ cutoff score of 30 was higher in our study compared to the results of the study by Cengiz et al., which found a 19.8% prevalence of an NES among a population of psychiatric patients including 51% of patients with MDD [17]. Lundgren et al. reported NES prevalence of 12.3% in a sample of general psychiatric patients [18]. Another study by Lundgren et al. reported a rate of 40% NES among patients who were diagnosed with any Axis I disorder [19]. In a descriptive study on NES, de Zwaan et al found that 56% of patients had a life-long history of major depressive disorder, which was higher than that seen among the healthy control group [20]. Orhan et al. found a higher rate of NES (35.2%) among outpatients compared to healthy participants (19.2%) [5]. These differences in NES prevalence may be attributed to cultural differences or severity of psychiatric diseases among the study samples.

It is important to identify other risk factors which may affect the development of NES. There are limited data on the relationship between gender and NES. Some authors have found that NES prevalence is comparable between genders [21]. On the other hand, three studies reported that the male gender was a risk factor for NES [5, 22]. Despite the higher number of female patients in our study, no significant relationship was found between gender and NES.

The literature has indicated that high BMI is a risk factor for NES. However, there was no significant difference between our study groups according to BMI. The literature has frequently stated that obesity or higher BMI is associated with NES in the general population [23,24]. In studies on psychiatric patient groups, only one study found higher BMI in the NES group [19]. In a study by Lundgren et al., although the study group was overweight on average (mean BMI=29.1 kg/m2), obese psychiatric patients (BMI ≥30 kg/m2) had five times higher likelihood of meeting NES criteria compared to non-obese patients (BMI 18.5–25.9 kg / m2) [19]. Previous studies have not found a significant difference between psychiatric participants with and without NES according to BMI [5,17,19]. This result may be attributed to the fact that the prevalence of high BMI is higher in psychiatry outpatients compared to normal population samples. Future studies are needed to examine possible changes in all weight ranges in psychiatric outpatients with NES.

Nicotine addiction was more prevalent among the NES group (p=0.001). In contrast, Lundgren et al. reported that 30.6% of patients with NES met the criteria for lifetime substance use disorder compared to 8.3% of patients without NES [18]. Considering the rates of impulse control disorder and nicotine use in the NES group, we believe that the presence of another risky behavior in addition to poor eating habits may contribute to the development of NES.

It is important to investigate the effects of drugs on NES. It was reported that the likelihood of being prescribed multiple atypical antipsychotics was higher among NES patients (38.8%) compared to non-NES patients (30.8%) [18]. We did not observe a significant relationship between drug use (antipsychotics, antidepressants, mood regulators) and NES among our study group. We believe that further studies on NES groups that specifically investigate the effect of atypical SSRIs and SNRIs, and that consider the relationship between these drugs and

high body mass index are needed.

In our study, impulse control disorders were found among patients with NES. As the NEDQ score increased, the impulsivity total score and subscores were observed to significantly increase. Saraçlı et al. conducted a study on a psychiatric population and found that the rate of impulse control disorders in the NES group was 7.2%, and stated that impulsivity was positively correlated with NES [21]. Tekin et al. investigated the relationship between eating addiction and impulsivity in young adults and stated that impulsivity was a risk factor in patients with NES [25]. The same study found that individuals with NES had higher impulsivity total scores and motor subscores compared to individuals without NES. In our study, NES patients were found to have significantly higher impulsivity total scores, and impulsivity attention, motor, and non-planning subscores.

Our study had various limitations. The lack of healthy control subjects was an important limitation. We did not use SCID to validate their MDD diagnoses and exclude other psychiatric comorbidities. Another limitation that the distribution of gender (women ratio is too high), all of the scales are self-reported. This study sample may contain other factors that may contribute to NES prevalence such as daily stress, sleeping disorder, and cultural differences. However, our sample size, as well as the evaluation of the relationship between NES and impulsivity as well as depressive symptoms distinguishes our study from other studies.

In conclusion, future studies with larger populations are needed to support our findings, to understand why this population is at high risk of developing NES, and to determine the effects of NES on the clinical outcomes of psychiatric patients. In addition, further comprehensive studies investigating psychotherapeutic and psychopharmacologic interventions of impulsive control disorder, which may play a role in the development of NES, to prevent its development and facilitate its treatment are needed.

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Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

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