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Night Eating Syndrome Frequency in University Students: Association with Impulsivity, Depression, and Anxiety

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ABSTRACT:

Night eating syndrome frequency in university students: Association with impulsivity, depression, and anxiety

Objective: The aim of this study was to examine frequency of night eating syndrome and its correlates with depression, anxiety, impulsivity and problematic eating behaviors in a university sample from Turkey.

Methods: Two hundred and ten students (99 men and 111 women) were included. All participants completed a sociodemographic form, Barratt Impulsiveness Scale (BIS), Beck Depression Inventory, Beck Anxiety Inventory, Night Eating Questionnaire (NEQ) and Eating Disorder Examination - Questionnaire (EDE-Q). Body mass index (BMI) of the participants were measured.

Results: We found 9.5% of the participants screened positive for NES. Overall scores for NEQ showed significant positive correlation with depression and anxiety symptoms as well as total score and sub-scores of BIS and EDE-Q. Predictive values of depression, anxiety and impulsivity were found to be higher than that of EDE-Q for NES.

Conclusion: NES is prevalent in university students. Depression and anxiety symptoms might predict NES. Impulsivity might be of significance for NES psychopathology as well. Impulsivity is more likely to predict NES when compared to EDE-Q scores.

Keywords: night eating syndrome, night eating, impulsivity, anxiety, depression.

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INTRODUCTION

Studies that investigate problematic eating behavior have been progressively draw attention as obesity prevalence has increased worldwide. Being considered a non-normative eating behavior, night eating syndrome (NES) is described as a "delay in the circadian pattern of food intake" and studies on this subject has been escalated in recent years. NES was first identified by Stunkard among obese individuals as a condition that caused failure to lose weight[1]. It was later conceptualized as a combination of disordered eating, sleeping, and mood. In the Diagnostic and Statistical Manual of Mental Disorders 5th edition (DSM-5), the importance of NES was recognized and it found its place under the category of "Other Specified Feeding or Eating Disorders"[2].

According to proposed criteria which were postulated by Allison et al.[3], NES is characterized by consumption of at least 25% of daily food intake after the evening meal or 2 episodes of nocturnal eating per week. Awareness and recall of the eating are required, as are significant distress or

impairment caused by the disorder. In addition to that, at least three of the following should be involved: morning anorexia, a strong urge to eat between dinner and sleep, insomnia, a belief that one must eat in order to initiate sleep, and worsening of mood in the evening. Exclusion criteria are another mental disorder, as well as medical disorders or medication that might better explain the disordered eating pattern. The disordered pattern of eating should maintain for at least 3 months[3].

Several epidemiological studies were conducted in order to understand the nature of this problematic eating behavior. Prevalence of NES is estimated to be at 1.1-1.5% in general population[4,5] and it raises by increment in body weight. Therefore NES prevalence is between 4.3% and 8.9% among weight loss treatment seeking individuals[6,7], 10.1% in class II-III obese adults[8] and 8-42% in bariatric surgery candidates[7,9-14]. In addition to that, there are several studies which demonstrate a positive correlation between NES and body mass index (BMI)[7,15-18]. Saraçlı et al. found the prevalence of NES as 22.4% in a sample of Turkish psychiatric outpatients based on a diagnostic interview[19].

One of the features which was described by Allison et al.[3] is the worsening of mood, notably in the evenings. Thus, the relationship between NES and depressive mood and/or major depressive disorder have been emphasized in literature[20,21]. According to a study conducted by DeZwaan et al., the prevalence of a lifetime major depressive disorder diagnosis is 55.7%, whereas current major depressive disorder diagnosis is approximately 19% in NES[21].

Although our knowledge about NES and depressive mood is sizeable, the relationship between NES and anxiety is relatively understudied. Lifetime ratio of having an anxiety disorders is substantially elevated in individuals who has NES when compared to healthy subjects[21,22]. Trait anxiety is associated with NES scores and relaxation exercises are found to be useful to reduce it[23]. According to the affect regulation model of eating disorders, disruptions in mood, perhaps secondary to stressful life events or perceived stress, may trigger a coping response of overeating[24]. On the other hand, Kucukgoncu and Bestepe were found the frequency of the NES 15.7% in Turkish psychiatric outpatients who diagnosed depression or anxiety disorders. They found NES frequency was 22% and 34.3% for major depression and anxiety disorders, respectively[25].

It is suggested that impulsivity might take part in the natural course of eating disorders and has been studied in eating disorders other than NES (i.e., Binge Eating Disorders - BED, Bulimia Nervosa - BN, and Anorexia Nervosa - AN). Impulsivity defined as a tendency to act on without enough foresight, forethought or conscious reasoning where the person is unable to delay pleasure or to take into consideration of potential risks as a result of poor control[26]. Impulsivity has a multidimensional structure and has been linked to several psychopathologies like addiction and attention deficit hyperactivity disorder (ADHD)[27]. Impulsivity is found to be elevated in obesity and in eating disorders which have binge eating episodes like BED and BN[28]. In BN patients, high levels of impulsivity yielded worse treatment outcomes[20]. In another study it was reported that co-occurrence of impulse control disorders and eating disorders negatively affect treatment outcomes and prognosis[30]. The association of impulsivity and NES has not been studied extensively. Vinai et al. found higher levels of impulsivity among NES than in control subjects[31]. Meule et al. also showed that Night Eating Questionnaire (NEQ) scores positively correlated with attentional subscore of the Barratt Impulsiveness Scale (BIS)[32].

In this study our primary aim was to examine frequency of night eating syndrome and its correlation with depression, anxiety, impulsivity and problematic eating behaviors. Although impulsivity has an important place in psychopathology and treatment of eating disorders, we have limited knowledge about how it interacts with NES. We also aimed to examine the predictive value of impulsivity for NES.

METHODS

Participants and Procedure

In this study, the data were collected from university students in Istanbul, Turkey. Participating in the study was volunteering based and an informed consent was taken form each participant before having filled out the study forms. Prior to data collection, we obtained permission from university administration committee and Istanbul University Cerrahpasa Medical Faculty Ethical Board Review Committee approved the study. Subjects who returned an incomplete questionnaire (n=8) or who did not want to participate (n=4) were excluded from the study.

A total of n=210 participants completed the study. Ninety-nine of them were men (%47.1). The mean age was 20.70±3.45 years. Mean height, weight and BMI of the participants were 171.42±8.48 cm; 65.41±14.22 kg; 22.11±3.72 kg/m², respectively. Of those participants, 29 (13.8%) fell under the category of underweight, 149 (70.9%) of normal, 24 (11.4%) of overweight, and 10 (4.3%) had grade I obesity, 1 (0.5%) had grade II obesity. 24 (11.6%) participants stated having a psychiatric disorders treated with psychopharmacological drugs, and 11 (5.2%) had history of suicide. 68 of the respondents (32.3%) were smokers and 5 (2.6%) answered positive for the question about problematic use of alcohol or other drugs.

Measurements

Students were scattered in smaller groups and instructed to fill out the forms in a quiet classroom. After informing about the study, students were asked to complete the sociodemographic data form and other self-rating scales. Age, height, body weight, education level, marital status, employment status, general medical background information, smoking history, and previous suicide attempts were questioned by sociodemographic data form, binge eating was considered present in participants who reported objective binge eating by DSM-IV-TR criteria[33]. The Night Eating Questionnaire (NEQ), The Eating Disorder Examination-Questionnaire (EDE-Q), the Barratt Impulsiveness Scale (BIS-11), Beck Depression inventory (BDI), Beck Anxiety Inventory (BAI) scales were administered.

Night Eating Questionnaire (NEQ): NES was diagnosed according to endorsement of proposed diagnostic criteria on the NEQ score. NES was assessed with the Night Eating Questionnaire (NEQ) using a clinical cut-off score of ≥ 25 for broad assessment and ≥ 30 for increased specificity. We used a clinical cut-off score of ≥ 25 for NES diagnosis. NEQ is a 14-item instrument for the assessment of night eating behaviors[14]. Items are scored on a five-point scale ranging from 0 (e.g., not at all) to 4 (e.g., extremely). Validity has been shown by positive relationships with sleep problems, eating disorder symptomatology, depressive symptoms, and eveningness preference[14]. It has an acceptable internal consistency of α=0.70. Atasoy et al.[34] completed the Turkish translation and validation of NEQ with an internal consistency of α=0.69 and test-retest reliability coefficient of 0.96.

The Eating Disorder Examination-Questionnaire: EDE-Q[35] is a 38 item self-report questionnaire which measures behaviors and attitudes towards eating and body image. It gives a global score and four subscales: restraint, eating concern, weight concern, and shape concern. In this present study, Turkish version which was validated by Yücel et al. with an internal consistency of α=0.93 was used[36].

The Beck Depression Inventory: BDI is a 21-itemed self scale which measures emotional, somatic, cognitive and motivational symptoms related to depression. It was created by Beck[37]. The Beck Depression Inventory is used to measure severity and variations in the intensity of depressive symptoms. The Turkish validity and reliability of the scale was established by Hisli[38].

The Beck Anxiety Inventory: BAI measures the frequency of anxiety symptoms experienced by individuals. It is a self-report scale scored between 0-3 and it consists of 21 items. The total score refers to the rate of elevated anxiety experienced by an individual. The inventory was developed by Beck et al.[39], and its reliability and validity in Turkish was studied by Ulusoy et al.[40].

The Barratt Impulsiveness Scale: The BIS-11[41] contains 30 items which assess impulsivity in daily life, including common impulsive and non-impulsive (for reverse scored items) behaviors and preferences. Items are rated on a 4-point scale. The BIS-11 has three subscales: Attentional Impulsiveness (8 items), Motor Impulsiveness (11 items), and Non-Planning Impulsiveness (11 items). The three subscales assess Attentional Impulsiveness (i.e., a tendency to rapid shifts in attention and to impatience with complexity), Motor Impulsiveness (i.e., a tendency to rush, immediate actions), and Non-Planning Impulsiveness (i.e., a tendency not to plan ahead and to ignore long-term consequences of one's actions). These three aspects of impulsivity are postulated to independently contribute to impulsive behavior in daily life. Turkish version's validity and reliability of the BIS-11 has been shown. Internal consistency is α=0.78 for university student sample and α=0.81 for patient population[42].

Table 1: Comparisons of variables between the participants who screened positive and negative for night eating disorder

	Night Eating Disorder (no)		Night Eating Disorder (yes)		
	n	%	n	%	p
Sex					
Male	89	46.8	10	50.0	χ^2=0.089
Female	101	53.2	10	50.0	p=0.473
Employment status					
Yes	34	17.9	2	10.0	X2=0.752
No	156	82.1	18	90.0	p=0.305
Marital status					
Unmarried	187	98.4	20	100.0	χ^2=0.326
Married	3	1.6	0	0.0	p=0.736
General Medical Illness					
Yes	15	7.9	3	15.0	χ^2=1.108
No	175	92.1	17	85.0	p=0.244
History of Suicide					
Yes	8	4.2	3	15.0	χ^2=4.128
No	182	95.8	17	85.0	p=0.077
Smoking					
Yes	60	31.6	8	40.0	χ^2=1.173
No	130	68.4	12	60.0	p=0.207
BED					
(-)	183	96.3	17	85.0	χ^2=4.980
(+)	7	3.7	3	15.0	p=0.060
BMI (kg/m^2)					
Underweight	26	14.3	3	15.0	χ^2=11.297
Normal	127	69.8	12	60.0	p=0.010
Overweight	23	12.7	1	5.0	
Obese	6	3.17	4	20.0	
BDI Score ≥ 16					
(+)	43	22.7	11	55.0	χ^2=9.714
(-)	147	77.3	9	45.0	p=0.003
BAI Score ≥ 17					
(+)	54	27.9	10	58.8	χ^2=7.015
(-)	139	72.1	7	41.2	p=0.008

BED, binge eating disorder; BMI, body mass index; Underweight, BMI <18.5; Normal weight, BMI 18.5–24.9; Overweight, BMI 25–29.9; Obese, BMI >29.9; BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory

Data Analyses

All statistical analyses were performed using SPSS 21.0 statistical software program. We used descriptive statistical methods (frequencies, percentages, means and standard deviations) for initial assessment. Then to evaluate the relationships between scales, we used Pearson Correlation Analysis and to determine independent variables effects on dependent variable we conducted Linear Regression Analysis. Mann Whitney U test was used to compare two quantitative not normally distributed data. A p value of <0.05 was accepted as statistically significant

RESULTS

The mean Night Eating Questionnaire score was 15.11±6.8 (min: 5, max: 42) and n=20 (9.5%) were above the cut-off point 25. Of those who had NES, 50% were women. Ten participants (4.8%) met the diagnostic criteria for Binge Eating Disorder (BED).

When sociodemographic features of NES and non-NES group were compared, there were no statistically significant differences for gender (p=0.437), employment status (p=0.305), marital status (p=0.736), medical history (p=0.736), suicide attempt (0.077), smoking status (p=0.207), and BED (0.060). However, body mass index values (p=0.01) and BDI scores (p=0.003) were significant difference between these two groups (Table 1).

Correlations between Night Eating Questionnaire, the Barratt Impulsiveness Scale, Eating Disorders Examination Questionnaire, BDI, and BAI are shown in Table 2. The correlation analyses between NEQ total scores and both BDI and BAI yielded positive correlations with r=0.38; p<0.001 and r=0.42 p<0.001, respectively. NEQ scores were positively correlated with all EDE-Q subscores except restricting type, which did not reach statistical significance (Table 2). Night Eating Questionnaire total scores showed positive correlations with the Barratt Impulsivity Scale scores (attentional subscore: r=0.29, p<0.001; motor subscore: r=0.24, p<0.001; non-planning subscore: r=0.24, p<0.001; total score: r=0.31, p<0.001).

The comparisons of EDE-Q, BIS-11, BDI, and BAI scores between participants who have night

Table 2: Correlations between scale scores

	1	2	3	4	5	6	7	8	9	10	11	12
1-NED	-											
2-EDE-Q Total	0.15***	-										
3-EDE-Q Restraint	0.01	0.80*	-									
4-EDE-Q Eating Concern	0.20**	0.86*	0.59*	-								
5-EDE-Q Weight Concern	0.15***	0.94*	0.62*	0.78*	-							
6-EDE-Q Shape Concern	0.17***	0.92*	0.61*	0.74*	0.90*	-						
7-BIS Attention	0.29*	0.13	0.0	0.15***	0.15***	0.14***	-					
8-BIS Motor	0.24*	0.02	-0.04	0.08	0.01	0.02	0.57*	-				
9-BIS Non-planning	0.24*	0.11	0.04	0.10	0.12	0.13	0.54*	0.41*	-			
10-BIS Total	0.32*	0.10	0.00	0.14	0.11	0.12	0.82*	0.79*	0.83*	-		
11-BDI	0.38*	0.30*	0.14***	0.32*	0.27*	0.31*	0.24**	0.13	0.24**	0.25*	-	
12-BAI	0.42*	0.29*	0.13	0.26*	0.32*	0.29*	0.28*	0.16***	0.12	0.22*	0.55*	-

NED: night eating disorder, EDE-Q: eating disorders questionnaire, BIS: Barratt impulsiveness scale, BDI: Beck depression inventory, BAI: Beck anxiety inventory, *p<0.001, **p<0.01, ***p<0.05

Table 3: Comparing scale scores according to severity of Night Eating Questionnaire

	NEQ<25 (n=190)			NEQ≥25 (n=20)				
	Median	25%	75%	Median	25%	75%	z	p
EDE-Q Restraint	0.6	0.0	2.0	1.6	0.0	2.2	-0.972	0.331
EDE-Q Eating Concern	0.2	0.0	1.2	1.1	0.1	2.8	-2.537	0.011
EDE-Q Weight Concern	0.9	0.1	2.3	1.6	0.6	4.9	-1.608	0.108
EDE-Q Shape Concern	0.6	0.2	1.8	1.7	0.4	4.2	-2.285	0.022
EDE-Q total	0.7	0.2	1.8	1.3	0.7	3.3	-1.946	0.052
BIS-Attention	16.0	14.0	18.0	20.5	17.0	21.0	-3.466	0.001
BIS-Motor	19.0	16.0	22.0	22.0	18.3	25.0	-3.195	0.001
BIS-Non-planning	24.0	21.0	27.0	28.5	24.0	31.8	-3.084	0.002
BIS-Total	59.0	53.0	65.0	70.5	62.5	79.0	-4.121	0.001
Beck-D	7.0	3.0	13.0	18.0	7.0	33.8	-3.056	0.002
Beck-A	7.0	3.0	15.3	20.0	8.8	34.0	-2.949	0.003

NEQ: night eating disorder, EDE-Q: eating disorders questionnaire, BIS: Barratt impulsiveness scale, BDI: Beck depression inventory, BAI: Beck anxiety inventory

Table 4: Hierarchical linear regression model when NES score was taken as a dependent variable

	Unstandardized Coefficients		Standardized Coefficients		
	Beta	Std. Error	Beta	t	p
Model1					
Step1					
(Constant)	11.490	0.675		17.029	0.001
Beck-D	0.149	0.053	0.216	2.825	0.005
Beck-A	0.187	0.047	0.307	4.018	0.001
Step2					
(Constant)	4.021	2.423		1.672	0.096
Beck-D	0.122	0.052	0.177	2.337	0.020
Beck-A	0.172	0.046	0.282	3.761	0.001
BIS	0.132	0.041	0.207	3.191	0.002
Model2					
Step 2a					
(Constant)	11.500	0.730		15.762	0.001
Beck-D	0.149	0.054	0.216	2.781	0.006
Beck-A	0.187	0.047	0.307	3.963	0.001
EDE-Q	-0.014	0.386	-0.002	-0.036	0.971

Step1 F=26.218 df=6.170 p<0.001, Adjusted R^2=0.214 R^2 change=0.214
Step2 F=21.703 df= 6.029 p<0.001 Adjusted R^2=0.253 R^2 change=0.040
Step2a F=17.839 df=6.186 p<0.001, Adjusted R^2=0.201 R^2 change=0.001

eating syndrome and who have not according to the night eating questionnaire total score are shown in Table 3. The ones who have night eating syndrome (i.e., scored 25 and above in NEQ) had significantly higher BDI and BAI scores than the ones who have not (p=0.002; p=0.003 respectively). In addition to that, they also had higher attention (p=0.001), motor (p=0.001), non-planning (p=0.002) subscores and total score (p<0.001) on BIS-11; as well as eating concern (p=0.011), weight concern (p=0.022) subscores on EDE-Q.

We found that depression, anxiety, and BIS-11 scores had explained 25.3% of the NEQ scores by hierarchical regression analysis; however no such an effect was observed for EDE-Q scores (Table 4).

DISCUSSION

We found that mean Night Eating Questionnaire score was 15.11±6.8 (min: 5, max: 42) and n=20 were above the cut-off point 25. Of those who had NES, 50% were women. Ten participants (4.8%)

met the diagnostic criteria for Binge Eating Disorder (BED). NES prevalence is around 1.1 to 1.5% in general population[4,5]. It is more frequent between the ages 18-30[43]. Two studies reported NES rates as 4.2%[44] and 5.7%[45] in college students. In our study, twenty participants (9.52%) met proposed diagnostic criteria for NES. It is 6 to 9 times higher than the general population and this difference might be attributed to the fact that college students have higher levels of stress[46] and more sleeping problems[47] than general population[44]. NES frequency is also approximately 2 times higher than that of previous studies, which included college students. This might be caused by high levels of concomitant anxiety and depression in our sample. It might reflect lower sensitivity of cut off point 25 compared to 30. The high frequency could also be explained by the small sample size and cultural differences.

Among the participants, depression was identified in 55% (11/20) of NES group and this rate was 22% (41/180) in non NES group. The positive relationship observed between the total NEQ score with the BDI is consistent with previous studies. Stunkard et al. reported that 75% of the individuals diagnosed as NES have more than one axis I disorder any time in their life[48]. Rogers et al. argued that obese patients who are also diagnosed as night eating disorder have more depressive symptomatology than the ones who are not diagnosed as NES[20]. Lundgren et al compared non-obese NES diagnosed patient and non-obese control group and they found that life time major depressive disorder rates were 73.7% and 18.2%, respectively[22]. Calugi et al. revealed a substantial correlation between NEQ and depression scores in patients who had class II and III obesity[8]. We have limited knowledge of the prevalence and specific clinical features of NES in Turkish population. Orhan et al.[49] and Kucukgoncu et al.[18] reported 35.2%, 21.3% of patients with depression had NES, respectively. Previous research has shown that BED might be a confounding factor on the relationship between NES and depression[7]. Our higher depression scores results between NES group is consistent with those studies. In clinical practice, clinicians should assess depression in patients diagnosed with night eating syndrome.

In our study anxiety symptoms were prevalent as well, like previous studies which screening anxiety among NES. Anxiety disorders are common among night eaters[22]. We also detected anxiety symptom rates were significantly higher among participants who had NES (p=0.003). In the literature, in patients with NES, lifetime rates of generalized anxiety disorder and post-traumatic stress disorder were 17% and 18%, respectively[21]. In another study, night eaters were found to be more prone to lifetime anxiety disorders (47.4%) when compared with healthy controls (9.1%)[22]. Although the effect of stressful life events on development or course of NES is not clear, NES tends to occur during periods of stressful life events. On the contrary of our results Moize et al. could show any relationship between the State Trait Anxiety Inventory scores and NEQ scores and they conclude that anxiety per se, is not a symptom of NES[50]. It is possible that some individuals eat in the evening or during the night in response to anxiety.

Previous studies about NES and other eating disorders reveals a moderate relationship with BED and BN[51-53]. Nonetheless, our knowledge of associations between NES and other eating disorders is limited. NES may be differentiated from BED and BN by the nature of ingestion as well as by accompanied clinical symptoms. Even though BED or BN could be manifested by nocturnal eating, food consumption following to waking up at night is more likely to be present in night eaters than are people with BED and BN[51,52]. Besides, total calorie of food consumed is far lower in NES than that in BED[54]. Duration of nocturnal eating is usually short and there is a will to return sleeping accompanies that period[55]. General psychopathology and eating pathology is higher in individuals who have NES and BED together than that of the ones who have NES alone[7,56]. In a clinical study, eating behaviors of patients who applied to an eating disorders outpatient clinic were evaluated and none of the anorexia nervosa patients reported night eating episode[57]. In our

study, night eaters were compared with non-night eaters by EDE-Q subscales and in night eaters EDE-Q Eating Concern and EDE-Q Shape Concern were significantly higher; whereas EDE-Q Restraint and EDE-Q Weight Concern subscales did not change between groups significantly. In line with our results, impulsivity evaluations of restricting type AN patients revealed lower levels of impulsivity scores in these individuals than in healthy control group[58]. As eating restrain and weight concern were not present in the ones with NES, it is possible that NES and anorexia have different psychopathological backgrounds. Besides, over-controlling features in anorexia patients and increased impulsivity scores of the participants with NES in our study might seem counter-intuitive and this might suggest why anorexia patients have lower rates of NES.

In our study; there were significant differences between NES and non-NES groups regarding all subscores of Barratt impulsivity scale. Vinai et al. found significantly higher levels of attentional impulsivity among patients with NES similar to our study[31]. Because diagnosis of NES is not as settled and it frequently overlaps with other eating disorders, there is a need for further evaluation of associated factors. Impulsivity is usually studied in context of BED, BN, and AN. In previous studies, Barratt Impulsiveness subscale scores were significantly higher in eating disorders that contain binge eating characteristics (i.e., BED, BN) compared to healthy controls and AN group[58]. Similarly, impulsivity rates are significantly higher in patients with on-going eating disorders, in a similar way to substance users[27]. Co-morbidity of impulse control disorders and eating disorders is important as it affects treatment outcome adversely[30]. There is a negative correlation between treatment outcome and impulsivity scores in BN patients[29].

We obtained significant correlations of BDI, BAI, EDE-Q, and BIS-11 with NEQ in our study. Besides, to determine the predictors of night eating syndrome, we computed hierarchical linear regression analyses. According to step 1 analysis, BDI and BAI scores could predict 20% of night eating syndrome cases (Adjusted R^2=0.205). With the step 2 analysis, 24% of the cases could be predicted by BIS-11 scores whereas step 2a analysis with EDE-Q resulted 20%. As a result, we identified that depression and anxiety symptoms are the most important predictors of NES among all we assessed, and impulsivity is more likely to predict NES when compared to EDE-Q scores. In literature, impulsivity is high in bulimia nervosa patients and it substantially increases with negative emotional states as well as stress[59,60]. Similarly, we confirmed a significant relationship of increasing levels of emotional symptoms (i.e., mood and anxiety) with NES and impulsivity severity.

Limitations of our study may include the fact that staying awake until late hours, high evening calorie consumption, and skipping breakfast are all characteristics of university students that may confound the findings. Also, there are several ways of measuring impulsivity including self-report scales and behavioral tests. More objective measurements might be obtained from behavioral tests. We used a self-report scale in this study therefore there may be biased or incorrect information given by participants. Lastly, another limitation was the use of self-reported height and weight to BMI.

CONCLUSION

NES is problematic eating disorder, which is prevalent in university students. Depression and anxiety symptoms might predict NES. Being aware of depression and anxiety symptoms might be important to prevent NES development. Impulsivity might be of significance for NES psychopathology as well. Impulsivity is more likely to predict NES when compared to EDE-Q scores.

References:

1. Stunkard AJ, Grace WJ, Wolff HG. The night-eating syndrome; a pattern of food intake among certain obese patients. Am J Med 1955;19(1):78-86. [CrossRef]

2. American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders (DSM-5®): American Psychiatric Publishing, 2013.

3. Allison KC, Lundgren JD, O'Reardon JP, Geliebter A, Gluck ME, Vinai P, et al. Proposed diagnostic criteria for night eating syndrome. Int J Eat Disord 2010;43:241-7.

4. Striegel-Moore RH, Dohm FA, Hook JM, Schreiber GB, Crawford PB, Daniels SR. Night eating syndrome in young adult women: prevalence and correlates. Int J Eat Disord 2005;37:200-6. [CrossRef]

5. de Zwaan M, Muller A, Allison KC, Brahler E, Hilbert A. Prevalence and correlates of night eating in the German general population. PloS One 2014;9:e97667. [CrossRef]

6. Stunkard AJ. Current views on obesity. Am J Med 1996;100:230-6. [CrossRef]

7. Colles SL, Dixon JB, O'Brien PE. Night eating syndrome and nocturnal snacking: association with obesity, binge eating and psychological distress. Int J Obes(Lond) 2007;31(11):1722-30. [CrossRef]

8. Calugi S, Dalle Grave R, Marchesini G. Night eating syndrome in class II-III obesity: metabolic and psychopathological features. Int J Obes (Lond) 2009;33(8):899-904. [CrossRef]

9. Rand CS, Kuldau JM. Morbid obesity: a comparison between a general population and obesity surgery patients. Int J Obes Relat Metab Disord 1993;(11):657-61.

10. Hsu LK, Betancourt S, Sullivan SP. Eating disturbances before and after vertical banded gastroplasty: a pilot study. Int J Eat Disord 1996;19(1):23-34. [CrossRef]

11. Rand CS, Macgregor AM, Stunkard AJ. The night eating syndrome in the general population and among postoperative obesity surgery patients. Int J Eat Disord 1997;22(1):65-9. [CrossRef]

12. Adami GF, Meneghelli A, Bressani A, Scopinaro N. Body image in obese patients before and after stable weight reduction following bariatric surgery. J Psychosom Res 1999;46(3):275-81. [CrossRef]

13. Powers PS, Perez A, Boyd F, Rosemurgy A. Eating pathology before and after bariatric surgery: a prospective study. Int J Eat Disord 1999;25(3):293-300. [CrossRef]

14. Allison KC, Lundgren JD, O'Reardon JP, Martino NS, Sarwer DB, Wadden TA, et al. The Night Eating Questionnaire (NEQ): psychometric properties of a measure of severity of the Night Eating Syndrome. Eat Behav 2008;9(1):62-72. [CrossRef]

15. Aronoff NJ, Geliebter A, Zammit G. Gender and body mass index as related to the night-eating syndrome in obese outpatients. J Am Diet Assoc 2001;101(1):102-4. [CrossRef]

16. Cerú-Björk C, Andersson I, Rössner S. Night eating and nocturnal eating-two different or similar syndromes among obese patients? Int J Obes Relat Metab Disord 2001;25(3):365-72. [CrossRef]

17. Lundgren JD, Allison KC, Crow S, O'Reardon JP, Berg KC, Galbraith J, Martino NS, Stunkard AJ. Prevalence of the night eating syndrome in a psychiatric population. Am J Psychiatry 2006;163(1):156-8. [CrossRef]

18. Kucukgoncu S, Tek C, Bestepe E, Musket C, Guloksuz S. Clinical features of night eating syndrome among depressed patients. Eur Eat Disord Rev 2014;22(2):102-8. [CrossRef]

19. Saraçlı Ö, Atasoy N, Akdemir A, Güriz O, Konuk N, Sevinçer GM, et al. The prevalence and clinical features of the night eating syndrome in psychiatric out-patient population. Compr Psychiatry 2015;57:79-84. [CrossRef]

20. Rogers NL, Dinges DF, Allison KC, Maislin G, Martino N, O'Reardon JP, et al. Assessment of sleep in women with night eating syndrome. Sleep 2006;29(6):814-9.

21. de Zwaan M, Roerig DB, Crosby RD, Karaz S, Mitchell JE. Nighttime eating: a descriptive study. Int J Eat Disord 2006;39(3):224-32. [CrossRef]

22. Lundgren JD, Allison KC, O'Reardon JP, Stunkard AJ. A descriptive study of non-obese persons with night eating syndrome and a weight-matched comparison group. Eat Behav 2008;9(3):343-51. [CrossRef]

23. Pawlow LA, O'Neil PM, Malcolm RJ. Night eating syndrome: effects of brief relaxation training on stress, mood, hunger, and eating patterns. Int J Obes Relat Metab Disord 2003;27(8):970-8. [CrossRef]

24. Spence S, Courbasson C. The role of emotional dysregulation in concurrent eating disorders and substance use disorders. Eat Behav 2012;13(4):382-5. [CrossRef]

25. Küçükgöncü S, Beştepe E. Night Eating Syndrome in Major Depression and Anxiety Disorders. Arch Neuropsychiatr 2014;51: 368-75. [CrossRef]

26. Solanto MV, Abikoff H, Sonuga-Barke E, Schachar R, Logan GD, Wigal T, et al. The ecological validity of delay aversion and response inhibition as measures of impulsivity in AD/HD: a supplement to the NIMH multimodal treatment study of AD/HD. J Abnorm Child Psychol 2001;29(3):215-28. [CrossRef]

27. Ranson KM, Wallace LM, Holub A, Hodgins DC. Eating disorders, substance use disorders, and impulsiveness among disordered gamblers in a community sample. European Eating Disorders Review 2013;21:148-54. [CrossRef]

28. Waxman SE. A systematic review of impulsivity in eating disorders. Eur Eat Disord Rev 2009;17(6):408-25. [CrossRef]

29. Keel PK, Mitchell JE. Outcome in bulimia nervosa. Am J Psychiatry 1997;154(3):313-21. [CrossRef]

30. Fernández-Aranda F, Pinheiro AP, Thornton LM, Berrettini WH, Crow S, Fichter MM, et al. Impulse control disorders in women with eating disorders. Psychiatry Res 2008;157(1-3):147-57. [CrossRef]

31. Vinai P, Ferri R, Anelli M, Ferini-Strambi L, Zucconi M, Oldani A, Manconi M. New data on psychological traits and sleep profiles of patients affected by nocturnal eating. Sleep Med 2015;16(6):746-53. [CrossRef]

32. Meule A. Impulsivity and overeating: a closer look at the subscales of the Barratt Impulsiveness Scale. Front Psychol 2013;4:177. [CrossRef]

33. Association Psychiatric Association. Diagnostic and statistical manual of mental disorders, 4th ed. Washington, DC: APA; 2000.

34. Atasoy N, Saracli O, Konuk N, Ankarali H, Guriz SO, Akdemir A, et al. The reliability and validity of Turkish version of The Night Eating Questionnaire in psychiatric outpatient population. Anadolu Psikiyatri Derg 2014;15(3):238-47.

35. Fairburn CG, Beglin SJ. Assessment of eating disorders: interview or self-report questionnaire? Int J Eat Disord 1994;16(4):363-70.

36. Yucel B, Polat A, Ikiz T, Dusgor BP, Elif Yavuz A, Sertel Berk O. The Turkish version of the eating disorder examination questionnaire: reliability and validity in adolescents. Eur Eat Disord Rev 2011;19(6):509-11. [CrossRef]

37. Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561-71. [CrossRef]

38. Hisli N. Beck Depresyon Envanterinin üniversite öğrencileri için geçerliği, güvenirliği. Psikoloji Dergisi 1989;7:3-13.

39. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol 1988;56(6):893-7. [CrossRef]

40. Ulusoy M, Sahin NH, Erkmen H. Turkish version of the Beck Anxiety Inventory: psychometric properties. J Cogn Psychother 1998;12(2):163-72.

41. Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt impulsiveness scale. J Clin Psychol 1995;51(6):768-74. [CrossRef]

42. Gulec H, Tamam L, Gulec MY, Turhan M, Karakus G, Zengin M, et al. Psychometric properties of the Turkish version of the Barratt Impulsiveness Scale-11. Klinik Psikofarmakoloji Bulteni-Bulletin of Clinical Psychopharmacology 2008;18:251-8.

43. Striegel-Moore RH, Franko DL, Thompson D, Affenito S, Kraemer HC. Night eating: prevalence and demographic correlates. Obesity 2006;14:139-47. [CrossRef]

44. Runfola CD, Allison KC, Hardy KK, Lock J, Peebles R. Prevalence and clinical significance of night eating syndrome in university students. J Adolesc Health 2014;55(1):41-8. [CrossRef]

45. Nolan LJ, Geliebter A. Night eating is associated with emotional and external eating in college students. Eat Behav 2012;13(3):202-6. [CrossRef]

46. Cooley E, Toray T, Valdez N, Tee M. Risk factors for maladaptive eating patterns in college women. Eat Weight Disord 2007;12(3):132-9. [CrossRef]

47. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep patterns and predictors of disturbed sleep in a large population of college students. J Adolesc Health 2010;46(2):124-32. [CrossRef]

48. Stunkard AJ, Faith MS, Allison KC. Depression and obesity. Biol Psychiatry 2003;54(3):330-7. [CrossRef]

49. Orhan FO, Ozer UG, Ozer A, Altunoren O, Celik M, Karaaslan MF. Night eating syndrome among patients with depression. Isr J Psychiatry Relat Sci 2011;48(3):212-7.

50. Moizé V, Gluck ME, Torres F, Andreu A, Vidal J, Allison K. Transcultural adaptation of the Night Eating Questionnaire (NEQ) for its use in the Spanish population. Eat Behav 2012;13(3):260-3. [CrossRef]

51. Lundgren JD, McCune A, Spresser C, Harkins P, Zolton L, Mandal K. Night eating patterns of individuals with eating disorders: implications for conceptualizing the night eating syndrome. Psychiatry Res 2011;186(1):103-8. [CrossRef]

52. Allison KC, Grilo CM, Masheb RM, Stunkard AJ. Binge eating disorder and night eating syndrome: a comparative study of disordered eating. J Consult Clin Psychol 2005;73(6):1107-15. [CrossRef]

53. Fischer S, Meyer AH, Hermann E, Tuch A, Munsch S. Night eating syndrome in young adults: delineation from other eating disorders and clinical significance. Psychiatry Res 2012;200:494-501. [CrossRef]

54. Birketvedt GS, Florholmen J, Sundsfjord J, Osterud B, Dinges D, Bilker W, et al. Behavioral and neuroendocrine characteristics of the night-eating syndrome. JAMA 1999;282:657-63. [CrossRef]

55. Spaggiari MC, Granella F, Parrino L, Marchesi C, Melli I, Terzano MG. Nocturnal eating syndrome in adults. Sleep 1994;17:339-44.

56. Napolitano MA, Head S, Babyak MA, Blumenthal JA. Binge eating disorder and night eating syndrome: psychological and behavioral characteristics. Int J Eat Disord 2001;30(2):193-203. [CrossRef]

57. Tzischinsky O, Latzer Y. Nocturnal eating: prevalence, features and night sleep among binge eating disorder and bulimia nervosa patients in Israel. Eur Eat Disorders Rev 2004;12:101-9. [CrossRef]

58. Claes L, Nederkoorn C, Vandereycken W, Guerrieri R, Vertommen H. Impulsiveness and lack of inhibitory control in eating disorders. Eat Behav 2006;(3):196-203. [CrossRef]

59. Fischer S, Smith GT, Anderson KG. Clarifying the role of impulsivity in bulimia nervosa. Int J Eat Disord 2003;33(4):406-11. [CrossRef]

60. Fischer S, Smith GT, Cyders MA. Another look at impulsivity: a meta-analytic review comparing specific dispositions to rash action in their relationship to bulimic symptoms. Clin Psychol Rev 2008;28(8):1413-25. [CrossRef]