

# Multicentre Survey on Relations of Night Eating Syndrome and Oral Health Status Among Turkish Dental School Students

## Türk Diş Hekimliği Fakültesi Öğrencilerinde Gece Yeme Sendromu ve Ağız Sağlığı İlişkileri Üzerine Çok Merkezli Araştırma

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**ABSTRACT Objective:** Night eating syndrome (NES) is a common eating disorder in which the circadian timing of food intake disturbs. The aim of the present study is to determine the prevalence of NES among dental school students and evaluate its association with body mass index (BMI), smoking status, alcohol consumption, and oral health status. **Material and Methods:** Night eating questionnaire consisting of 14 questions was conducted on dental school students at 3 universities and a total of 30 points and higher was determined as a cut-point for NES diagnosis. Demographic status, medical status, BMI, smoking/alcohol consumption, carious/filled teeth, and interval of brushing are recorded. **Results:** Twelve (3.5%) of the study group among 346 attendants revealed NES diagnosis. Students with NES showed significantly higher average body weight values ( $p<0.05$ ) on the other hand average BMI values did not differ among groups with and without NES ( $p>0.05$ ). Smoking rates (91.7%) and alcohol consumption (83.3%) were significantly higher in students with NES ( $p<0.05$ ). Number of carious teeth were found higher, oral health status, tooth brushing habit was found poorer in NES diagnosed subjects ( $p<0.05$ ). **Conclusion:** This present study concluded that NES diagnosis was relatively low in dental students. NES could be a risk factor for impaired oral hygiene, especially in dental students with smoking habits and alcohol consumption. Oral hygiene knowledge and attitudes contribute to decreasing night eating habits in dental students.

**Keywords:** Night eating syndrome; dental caries; oral health; body mass index; smoking

**ÖZET Amaç:** Gece yeme sendromu (GYS), gıda alımının sirkadiyen zamanlamasının bozulduğu yaygın bir yeme bozukluğudur. Bu çalışmanın amacı, diş hekimliği fakültesi öğrencileri arasında GYS sıklığını belirlemek ve beden kitle indeksi (BKİ), sigara içme durumu, alkol tüketimi ve ağız sağlığı durumu ile ilişkisini değerlendirmektir. **Gereç ve Yöntemler:** Üç üniversitenin diş hekimliği fakültesi öğrencilerine, 14 sorudan oluşan gece yeme anketi (GYA) uygulanmıştır. GYS tanısı için sınır değer olarak toplam 30 puan ve üzeri belirlenmiştir. Demografik durum, tıbbi durum, BKİ, sigara/alkol kullanımı, çürük/dolgu dişler ve fırçalama aralığı kaydedilmiştir. **Bulgular:** Araştırmaya katılan 346 kişiden 12'sinde (%3,5) GYS bulguları belirlenmiştir. GYS bulguları olan öğrencilerin ortalama vücut ağırlık değerleri daha yüksekti ( $p<0,05$ ) görülmüş, ancak ortalama BKİ değerleri, GYS olan ve olmayan gruplar arasında farklılık göstermemiştir ( $p>0,05$ ). GYS olan öğrencilerde sigara içme oranları (%91,7) ve alkol tüketimi (%83,3) anlamlı olarak daha yüksek bulunmuştur ( $p<0,05$ ). GYS tanılı kişilerde çürük dişlerin sayısı daha fazla, ağız sağlığı durumu ve diş fırçalama alışkanlığı daha kötü bulunmuştur. **Sonuç:** Bu çalışma, diş hekimliği öğrencilerinde GYS tanısının nispeten düşük olduğunu göstermiştir. GYS, özellikle sigara içme alışkanlığı ve alkol tüketimi olanlarda bozulmuş ağız hijyeni için bir risk faktörü olabilir. Ağız hijyen bilgisi ve tutumları gece yeme alışkanlıklarının azalmasına katkıda bulunabilir.

**Anahtar Kelimeler:** Gece yeme sendromu; diş çürükleri; ağız sağlığı; beden kitle indeksi; sigara içme

Night eating syndrome (NES) was first described by Stunkard et al. in 1955 as a disorder characterized by anorexia, evening hyperphagia, and insomnia in the morning in patients with treatment-resistant obesity.<sup>1</sup> NES is characterized by the sepa-

ration of eating and sleep circadian rhythms and a delay in the way of eating, and defined by symptoms such as evening hyperphagia, waking up at night and, eating, morning anorexia and sleep disturbance.<sup>2</sup> Biological rhythms of eating and sleep are separated in

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NES. As a result of the delay in energy intake, people's morning appetite is suppressed, while evening and night food intake increases. Eating syndromes have various effects on oral tissues. Anorexia nervosa is reported to cause enamel erosion, oral mucosal lesions, and sialoadenitis; similarly, obesity is associated with poor oral health status.<sup>3-6</sup> Although different diagnostic criteria have been used in the studies since the initial definition of NES, the diagnostic criteria used by Stunkard are the most commonly used.<sup>7</sup> Due to the differences in diagnostic criteria, it is difficult to make comparisons in studies. To prevent confusion and ensure diagnostic consistency, night eating questionnaire (NEQ) was developed by Allison et al.<sup>8</sup> NEQ is a survey consisting of 14 questions, including questions about eating habits, timings, morning appetite, initial eating time, evening/night meals, the rate of food intake after dinner, craving, control overnight eating behavior, difficulty falling asleep, frequency of eating at night, awareness and mood during night meals. Taymur et al. presented 13.2% NES in the whole Turkish population and Sevincer et al. presented 9.5% in Turkish university students.<sup>9,10</sup>

The relationship between NES and oral health status in the population has not been investigated yet. The specific aim of the present study is to examine the relationship of NES with demographics, oral health status, smoking and alcohol consumption, general health status, and body mass index (BMI) among a group of Turkish dental school students.

## MATERIAL AND METHODS

### STUDY POPULATION

The study was approved by İstanbul Medipol University Non-Interventional Clinical Research Ethics Committee December 25, 2019 and numbered 1173. The research was done in complete compliance with the Helsinki Declaration. Written informed consent was received from all participants. Data for this observational study were obtained by a self-administered questionnaire. Study participants (17-38 years) were dental school students in 3 different universities in İstanbul region. The written questionnaire was individually responded after taking verbal consent. In-

dividuals who have not attended an intraoral examination within the recent 6 months were excluded. Total number of participation was 346 students; 205 females (59.2%) and 141 males (40.8%).

### MEASUREMENTS

All data including demographics, anthropometric measures, medical status (any systemic condition), smoking/alcohol consumption, decay/filled teeth, and interval of brushing are based on individual response through the survey. No clinical evaluation of the participants were carried out. Regarding anthropometrics, height and weight values that were stated by the participants were used to calculate BMI; via weight (kg)/square of body height (m<sup>2</sup>) formula.

To evaluate NES, the Turkish version of the NEQ was used in the present study.<sup>11</sup> The NEQ evaluates eating habits and emotional status via 14 items. All items are scored between 0-4 with a five-point Likert scale. Question 7 is scored as 0 points for intraday emotionally stable subjects and with a 7 point Likert scale. Questions 1, 4, and 14 are reverse coded. The score range is between 0-52 and the cut-off score was 30 points and above for NES diagnosis. All attendants answered the first nine questions of the questionnaire and the participants who do not wake up at night to have a snack subsided and did not continue with the ongoing questions. Questions 10-12 are filled by the participants with night awakenings and questions 13 and 14 with night snacks.

### STATISTICAL ANALYSIS

Shapiro-Wilks test was used to evaluate the compatibility of the parameters with normal distribution. In addition to descriptive statistical methods (mean, standard deviation, frequency); for analysis of quantitative data, Student's t-test was used for the comparison of normally distributed parameters; and the Mann-Whitney U test was used for comparisons of abnormally distributed parameters. Fisher's exact chi-square test and Fisher-Freeman-Halton test were used to compare qualitative data. Significance was evaluated at the level of  $p < 0.05$ . IBM SPSS Statistics, Version 22.0 (Armonk, NY) software was used for the analysis of data.

## RESULTS

The study group consisted of 346 participants with a mean age of 20.96±2.25 years. Distribution of the subjects among grades were as follows with no significance (p=0.949); 191 (29.2%) 1<sup>st</sup> grade, 47 (13.6%) 2<sup>nd</sup> grade, 95 (27.5%) 3<sup>rd</sup> grade, 56 (16.2%) 4<sup>th</sup> grade and 47 (13.6%) were 5<sup>th</sup> grade. Total NEQ scores ranged between 5-37, with an average of 16.21±5.49 and a median value of 15. The analytics revealed only 12 (3.5%) students met NES criteria (Table 1).

While no difference was observed in terms of average age (p=0.836) and height (p=0.196); students with NES showed significantly higher average

weight values (p=0.026). On the other hand, both average BMI values between groups (p=0.088) and distribution among BMI subgroups did not alter significantly (p=0.346). No difference was found among genders (p=0.240) and among different years in dental school (p=0.949).

Smoking rates were significantly high in subjects with NES (91.7%) (p=0.000) as well as weekly cigarette pack consumption (p=0.000). Alcohol consumption rates (83.3%) in the NES group was significantly higher than the group without NES (34.1%) (p=0.000) and also weekly alcohol consumptions in NES group were also higher (p=0.001) (Table 1). Regarding general health status and medication usage; statistics were non-significant (p<sub>1</sub>=0.334, p<sub>2</sub>=0.646).

**TABLE 1:** Study demographics, smoking, alcohol and general health data according to presence of NES.

		NES			p value	
		(+) (n=12)	(-) (n=334)	Total (n=346)		
Age	Av±SD	20.83±2.12	20.97±2.26	20.97±2.25	<sup>1</sup> 0.836	
Height	Av±SD	174.92±11.05	170.49±8.06	170.64±8.2	<sup>1</sup> 0.196	
Weight	Av±SD	73.5±14.91	64.82±13.17	65.12±13.31	<sup>1</sup> 0.026*	
BMI	Av±SD	23.91±3.51	22.12±3.57	22.18±3.57	<sup>1</sup> 0.088	
BMI	n (%)	Underweight	1 (8.3%)	43 (12.9%)	44 (12.7%)	<sup>4</sup> 0.346
		Normalweight	7 (58.3%)	224 (7.1%)	231 (66.8%)	
		Overweight	3 (25%)	59 (17.7%)	62 (17.9%)	
		Obese	1 (8.3%)	8 (2.4%)	9 (2.6%)	
Gender	Female	5 (41.7%)	200 (59.9%)	205 (59.2%)	<sup>2</sup> 0.240	
	Male	7 (58.3%)	134 (40.1%)	141 (40.8%)		
Smoking	n (%)	(+)	11 (91.7%)	86 (25.7%)	<sup>2</sup> 0.000*	
		(-)	1 (8.3%)	248 (74.3%)		249 (72%)
# of consumed cigarette packs	Av±SD (median)	6.75±3.67 (7)	0.96±2 (0)	1.16±2.33 (0)	<sup>3</sup> 0.000*	
Alcohol use	n (%)	(+)	10 (83.3%)	114 (34.1%)	<sup>2</sup> 0.000*	
		(-)	2 (16.7%)	220 (65.9%)		222 (64.2%)
Amount of consumed alcohol	Av±SD (median)	4.17±6.52 (1)	1.06±2.21 (0)	1.16±2.53 (0)	<sup>3</sup> 0.001*	
Grade	n (%)	1	5 (41.7%)	96 (28.7%)	101 (29.2%)	<sup>4</sup> 0.949
		2	1 (8.3%)	46 (13.8%)	47 (13.6%)	
		3	3 (25%)	92 (27.5%)	95 (27.5%)	
		4	2 (16.7%)	54 (16.2%)	56 (16.2%)	
		5	1 (8.3%)	46 (13.8%)	47 (13.6%)	
General health problem	n (%)	(-)	10 (83.3%)	302 (90.4%)	<sup>2</sup> 0.334	
		(+)	2 (16.7%)	32 (9.6%)		34 (9.8%)
Use of medication	n (%)	(-)	10 (83.3%)	294 (88%)	<sup>2</sup> 0.646	
		(+)	2 (16.7%)	40 (12%)		42 (12.1%)

<sup>1</sup>Student t-test; <sup>2</sup>Fisher's exact test; <sup>3</sup>Mann-Whitney U test; <sup>4</sup>Fisher-Freeman-Halton test; \*p<0.05; NES: Night eating syndrome; Av±SD: Avarage±standard deviation; BMI: Body mass index.

**TABLE 2:** Evaluation of tooth decay, fillings and tooth brushing data in students with/without NES.

	NES			p value
	(+)	(-)	Total	
Decay $Av \pm SD$ (median)	4 $\pm$ 8.36 (2)	0.76 $\pm$ 1.47 (0)	0.87 $\pm$ 2.16 (0)	<sup>1</sup> 0.014*
Fillings $Av \pm SD$ (median)	3.25 $\pm$ 3.08 (4)	2.32 $\pm$ 2.91 (1.5)	2.35 $\pm$ 2.91 (2)	<sup>1</sup> 0.325
Tooth brushing frequency/day $Av \pm SD$ (median)	1.25 $\pm$ 0.75 (1)	1.81 $\pm$ 0.65 (2)	1.79 $\pm$ 0.66 (2)	<sup>1</sup> 0.002*
Tooth brushing at night $n$ (%)	Every night	271 (81.1%)	275 (79.5%)	<sup>2</sup> 0.000*
	Sometimes	2 (16.7%)	28 (8.1%)	
	Never	6 (50%)	37 (11.1%)	

<sup>1</sup>Mann-Whitney U test; <sup>2</sup>Fisher-Freeman-Halton test; \*p<0.05; NES: Night eating syndrome; Av $\pm$ SD: Average $\pm$ standard deviation.

Determinants of oral health status including the number of tooth caries were significantly higher (p=0.014); as well, the frequency of tooth brushing was found to be significantly lower in the NES group (p=0.002). Groups did not differ statistically in relation to the number of previous dental fillings (p=0.325). The frequency of brushing each night was significantly lower in the NES group (33.3%), compared to subjects without NES (81.1%) (p=0.000) (Table 2).

## DISCUSSION

The prevalence of NES in young adults is 1.3-5.69% in different populations.<sup>12-15</sup> Runfola et al. reported that people diagnosed with NES are more prone to self-injurious behavior, mental health problems, and poorer life quality.<sup>14</sup> The prevalence of NES among different dental school students was 3.5% in this study, which is significantly lower than the previous study outcomes. Frequency is found to be 13.2% in the Turkish population by Taymur et al. and 9.5% in Turkish university students by Sevincer et al.<sup>9,10</sup> Many variables including stress, sleep disturbances, poor physical activity, low psychosocial interaction, and disordered eating may facilitate the development of NES in university students. Likewise, a dental school curriculum with a diversified amount of lectures both in theory and laboratories enforce diminished physical and social activities as well as increases the off-school hours in studying.

Conflicting results were available when exploring gender differences with night eating habits.<sup>16</sup> Although several studies stated that there was no

statistically significant difference between the gender distributions of students with and without NES which was similar to our results, the association between gender and NES was shown in some studies.<sup>1,17,18</sup>

After the initialization of NES, it takes time to gain weight, so the relationship between BMI and NES may not be noticeable in young individuals.<sup>19-21</sup> In the present study, there was no relationship between NES and BMI, as previously stated in studies.<sup>13-15</sup> Similar to our results, higher average weight values of diagnostic NES participants can experience elevated BMI and obesity later in life, proven by researches thus, establishing risk factors for systemic diseases.<sup>22,23</sup> Allison et al. demonstrated that the frequency of commencement of NES among obese people with Type 2 diabetes is noteworthy, while the study by Morse et al. reported that NES concerns 9.7% of people suffering from diabetes.<sup>24,25</sup> However, no relationship was found between NES and systemic diseases in the present study. This result could be explained by the relative younger age of our study population.

The association between NES and oral health is unknown to our knowledge and literature search. Concerning the association of NES and smoking status; our results indicated positive relationship in line with the previous study.<sup>15</sup> Our study revealed higher results for smoking status, smoking quantity, alcohol consumption, and alcohol quantity students with NES. Regarding the relationship between metabolic syndrome and alcohol consumption, Ashizawa et al. presented a positive relationship for both genders.<sup>26</sup>

On the basis of known negative effects of smoking and alcohol consumption on oral health, we can state that participants with NES may encounter worse oral health status. There is restricted data involving the relationship between night eating habits and oral health. Literature survey revealed only one study, that nocturnal eating was found related to the number of missing teeth, periodontal disease, and active tooth decay.<sup>27</sup> On the basis of evaluating oral health status, our survey identifies the number of carious and filled teeth as well as tooth brushing habits (tooth brushing frequency and tooth brushing at night). The result of our study reveals a higher number of caries in the NES group. No relationship was observed in terms of the number of fillings. However, the outcomes may increase the need for fillings or the number of missing teeth in later decades. Previous research by Batra et al. have stated a positive relationship between tooth brushing frequency and decayed, missing, or filled.<sup>28</sup> Regarding literature search, this is the first study to assess the relationship between NES and tooth brushing habits. Daily tooth brushing frequency and night brushing were significantly lower in NES students, that also support the increased number of caries.

There are a few limitations in this study. Detailed dietary habits and number of missing teeth have not been questioned, the study is conducted only on dentistry students and oral health status is based on the response bias of the individuals that have passed through a dental examination in the previous 6 months. Prospective analysis carried out by dental care professionals including the above mentioned topics is suggested in order to approach accurate information, for the subsequent researches. In addition, more detailed data and further statistical analysis is needed to be explain the relation between NES and oral health.

## CONCLUSION

This present study revealed that the frequency of NES among dental school students is lower than the society and university students in general. However, NES could be considered as a risk factor for impaired oral hygiene and tooth caries, especially in individuals with smoking habits and alcohol consumption. Also, cross sectional clinical studies are needed to reveal inter-relations of oral hygiene with smoking/alcohol consumption with NES. Regarding knowledge and attitudes of dental students on oral health, they should assume an awareness-raising role about their healthy dietary lifestyle within their community.

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*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### Conflict of Interest

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

**Idea/Concept:** Kader Cesur Aydın, Selin Gaş, Alperen Tekin, Oğuzhan Demirel; **Design:** Kader Cesur Aydın, Selin Gaş; **Control/Supervision:** Kader Cesur Aydın; **Data Collection and/or Processing:** Kader Cesur Aydın, Selin Gaş, Alperen Tekin, Oğuzhan Demirel; **Analysis and/or Interpretation:** Kader Cesur Aydın, Selin Gaş, Alperen Tekin; **Literature Review:** Kader Cesur Aydın; **Writing the Article:** Kader Cesur Aydın; **Critical Review:** Kader Cesur Aydın, Selin Gaş, Alperen Tekin; **References and Fundings:** Kader Cesur Aydın; **Materials:** Kader Cesur Aydın, Selin Gaş.

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