

# Food Related Behaviors and Sleep Quality in University Students: A Descriptive Study

Ayşe Hümeysra İslamoğlu<sup>1</sup> , Güleren Sabuncular<sup>1</sup> 

<sup>1</sup>Marmara University Faculty of Health Sciences Nutrition and Dietetics Department, Istanbul/Turkey

Ayşe Hümeysra İSLAMOĞLU  
Güleren SABUNCULAR

**Correspondence:** Ayşe Hümeysra İslamoğlu  
Marmara University Faculty of Health Sciences  
Nutrition and Dietetics Department, Istanbul/  
Turkey  
**Phone:** +905302356631  
**E-mail:** humeyra.bicer@gmail.com

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## ABSTRACT

**Purpose:** The purpose of this study was to evaluate the relationship between food addiction, night eating status and sleep quality in students studying at different faculties or departments of various universities in Turkey.

**Methods:** A total of 1044 students from 11 different departments/faculties were included. Night Eating Questionnaire, Yale Food Addiction Scale and Pittsburgh Sleep Quality Scale were applied to the students. Also, the dietary habits (main meal and snack consumptions, the meal they skipped and the reasons, duration of meals, consumption of tea and coffee etc.) of the students were questioned.

**Results:** Significant relationships were found between BMIs, faculties/departments, use of antidepressants, skipping breakfast status and tea/coffee consumption of students. Moreover, there were significant differences between both food addiction status ( $p<0.001$ ), night eating syndrome ( $p<0.001$ ) and sleep quality. Students with poor sleep quality had more frequent night eating behavior and food selectivity.

**Conclusion:** These findings suggest that for managing students' eating problems like night eating and food addiction, their sleep quality should be improved, and vice versa.

**Keywords:** Sleep quality, Food addiction, Night eating syndrome, University students

## Üniversite Öğrencilerinde Besin İlişkili Davranışlar ve Uyku Kalitesi: Tanımlayıcı Bir Çalışma

### ÖZET

**Amaç:** Bu çalışmanın amacı, Türkiye'deki çeşitli üniversitelerin farklı fakülte veya bölümlerinde okuyan öğrencilerde gıda bağımlılığı, gece yeme durumu ve uyku kalitesi arasındaki ilişkiyi değerlendirmektir.

**Yöntem:** Çalışmaya 11 farklı bölüm/fakülteden toplam 1044 öğrenci dahil edildi. Öğrencilere Gece Yeme Anketi, Yale Gıda Bağımlılığı Ölçeği ve Pittsburgh Uyku Kalitesi Ölçeği uygulandı. Ayrıca öğrencilerin beslenme alışkanlıkları (ana öğün ve ara öğün tüketimleri, atladıkları öğün ve nedenleri, öğün süreleri, çay/kahve tüketimleri vb.) sorgulanmıştır.

**Bulgular:** Öğrencilerin BKİ'leri, fakülte/bölümleri, antidepresan kullanımı, kahvaltıyı atlama durumu ve çay/kahve tüketimi arasında anlamlı ilişkiler bulunmuştur. Ayrıca, hem gıda bağımlılık durumu ( $p<0.001$ ) hem de gece yeme sendromu ( $p<0.001$ ) ile uyku kalitesi arasında anlamlı fark saptanmıştır. Düşük uyku kalitesine sahip öğrenciler, daha sık gece yeme davranışına ve besin seçiciliğine sahip bulunmuştur.

**Sonuç:** Bu bulgular, öğrencilerin gece yeme ve gıda bağımlılığı gibi yeme problemlerini yönetmek için uyku kalitelerinin iyileştirilmesi gerektiğini ve bunun tersinin de geçerli olduğunu göstermektedir.

**Anahtar Kelimeler:** Uyku kalitesi; Gıda bağımlılığı; Gece yeme sendromu; Üniversite öğrencileri

**N**utrition is necessary to suppress hunger and meet nutrient needs. Changes in living conditions and changes in diet affect people's lifestyle (1). Among Turkish university students' obesity and eating disorders are increasing, possibly associated in part with factors such as leaving their homes and families, different eating patterns, lack of nutritional information, and lack of money (2). Eating behaviors that are frequently seen especially among university students include night eating behavior and compulsions towards certain foods, which some researchers call "food addiction". At the same time, many students experience changes in sleep patterns, duration, and quality (3). Basically "food addiction" is characterized by a persistent or repeated desire to eat and some behavioral disorders in order to feel the pleasurable effects of food which occurs when the food eaten or to avoid the discomfort that occurs when the person does not eat the food (4). Night eating syndrome (NES) was first described by Stunkard et al. in 1955 as a disorder characterized by anorexia in the morning, hyperphagia and insomnia in the evening in obese patients who are resistant to weight loss (5). It has been suggested that one of the most common disorders in recent years is night eating syndrome (6). Individuals with NES get most of their total energy after dinner, wake up more frequently during the night, and are more likely to eat while awake (7, 8). Sleep is a basic physiological need to remain both physical and psychological health (9). Sleep quality refers to the sustainability of sleep and the individual's feeling of being rested enough (10). There are many environmental, psychological and physiological factors that affect sleep quality, and one of them is nutrition. Disruptions in sleep duration and quality can cause physiological and behavioral changes that may lead to eating disorders. Sleep disorders play an important role in the occurrence of night eating syndrome, and some people with night eating syndrome are reported to have low sleep quality (3).

In literature, it is revealed that people who have short sleep duration increased their food consumption the next day (11). Also, night eating is associated with both food addiction and poor sleep quality (12).

It is thought that both food addiction, night eating and sleep quality are interrelated. The aim of this study is to examine whether other factors (prolonged study duration, use of antidepressant, etc.) as well as night eating and food addiction have an effect on sleep quality of Turkish students.

## Materials and Methods

This cross-sectional descriptive study was carried out between January and May 2021 with students attending to private and state universities in Turkey. The students who participated in the study have been given detailed information about the study and given an informed volunteer consent form. The study was approved ethically by the Marmara University Faculty of Health Sciences Ethics Committee for Non-Invasive Clinical Studies with the protocol no: 30.12.2020/86, and the research was conducted following the principles stated in the Helsinki Declaration.

### Study Population

The subjects were university students studying at faculties of health sciences, law, medicine, dentistry, pharmacy, engineering and architecture throughout Turkey (N=664.231). The selected faculties differ in terms of criteria such as course load, project preparation, course intensity, study and time allocated to preparation. For this reason, the sample was chosen considering that the students studying in these faculties may differ in terms of night eating syndrome, sleep quality and food addiction.

The sample size was calculated using the EpiInfo program. In this calculation, the sample size was determined as 768 when the incidence of the event was 50%, the error level was 5%, and the pattern effect was taken as 2. It was planned to take 845 students into the sample due to the losses (approximately 10%) that may arise during the research process. Stratified sampling was made according to faculties.

### Data Collection

#### General Features

This part included general information such as age, gender, department of faculty, time spent daily study, presence of diagnosed disease, use of antidepressant medication and vitamin supplements, physical activity level, whether they worked in any job, and anthropometric measurements.

#### Dietary Habits

Number of main meals and snacks consumed by the participant during the day, with whom they usually consumed meals, whether they skipped any meals and if so which meal/meals they skipped and the reasons for skipping meals, whether they were busy with other tasks while consuming meals, whether changes in their mood affect their appetite, their eating speed, time of their

evening meal and tea/coffee consumption during the day were assessed.

### The Night Eating Questionnaire (NEQ)

The NEQ is a 16-question questionnaire developed by Allison and colleagues. Except for the 7th question, the questions were scored between 0-4 with a five-point Likert type measurement. In the 7th question, people's mood changes during the day were questioned and those who did not experience changes during the day received 0 points. Questions number 1, 4 and 14 were reverse scored. The total score range of the scale varied between 0-52. A value above 25 points was accepted as "there was a NES" and a value below 25 points is considered as "no NES" (13, 14).

### The Pittsburgh Sleep Quality Index (PSQI)

The PSQI consisted of a total of 24 questions. The 18 questions of the scale consisted of 7 components. Each question in the questionnaire was evaluated between 0-3 points. The total score of these seven components gave the total scale score. The total score was between 0-21. A total score greater than or equal to 5 indicated poor sleep quality, and less than 5 indicated good sleep quality (15, 16).

### The Yale Food Addiction Scale (YFAS)

The YFAS is a 27-item scale used to determine addictive-like eating behaviors in the last twelve months. While the scale was being evaluated, the 17th, 18th and 23rd questions were not taken in the scoring. All questions were collected under all addiction criteria (tolerance, deprivation, clinical symptoms, etc.). Score equaled to 1 and above, this criterion had been met and the score was taken as 1; scores equal to 0, it meant that this criterion had not been met. If the score was 1, there was food addiction (17).

### Statistical Analysis

The data were evaluated statistically using the SPSS (Statistical Package for the Social Sciences) 26.0 package program. Frequency distributions were used for descriptive characteristics of the individuals including their general health status, use of vitamin supplements and antidepressants, physical activity status, and their dietary habits. Median, maximum and minimum values were used for descriptive statistics. The Kolmogorov Smirnov test was used to determine whether the mean scores of the scale were compatible with the normal distribution. Comparisons between groups were made using non-parametric Mann Whitney U and Kruskal Wallis tests. Comparisons between groups in categorical variables (expressions as numbers and percentages) were examined with the chi-square test. Spearman correlation test was used to determine

the correlations between variables. Statistical significance was accepted as  $p < 0.05$  in all analyzes.

## Results

Table 1 provides the general characteristics of the students participating in the study. Among the participants, 69% were female and 31% were male, 96% did not use antidepressants and 68% had a normal body mass index (BMI).

Table 1. General characteristics of students (n=1044)		
	n	%
<b>Gender</b>		
Female	717	69
Male	327	31
<b>Study duration per day</b>		
< 1 hour	57	6
1-2 hours	317	30
3-4 hours	344	33
> 4 hours	326	31
<b>Use of antidepressant</b>		
Yes	45	4
No	999	96
<b>BMI</b>		
Underweight	133	13
Normal	708	68
Overweight	159	15
Obese	44	4

Table 2 describes the sleep quality according to the characteristics of those included in the study, of which with poor sleep quality (n=703), 67% were female; with good sleep quality (n=341), 71% were female.

A significant relationship was found between BMI and sleep quality ( $p=0.03$ ) of students. Accordingly, the sleep quality score of overweight students (median:7.0 – min.:1.0; max.:14.0) was significantly higher ( $p=0.005$ ) than the score of students with normal BMI (median:6.0 – min.:0.0; 18.0). In addition, when the sleep quality scores of obese students (median:8.0 – min.: 1.0; max.:14.0) were compared to students with normal BMI (median:6 – min.:0.0; 18.0); obese students had higher scores ( $p=0.002$ ) (not shown in the table). It was determined that 65% of the participants with poor sleep quality had BMIs within normal limits, 14% were underweight, 16% were overweight and 5% were obese.

Among the participants included in the study, 83% of those with good sleep quality stated that they did not skip the morning meal, while 34% of those with poor sleep quality did so. A significant relationship was found between skipping the morning meal and sleep quality ( $p < 0.001$ ). When the daily study durations were examined, it was seen that 33% of all students study for 3-4 hours a day, but there was no significant relationship between study duration and sleep quality ( $p > 0.05$ ).

There was a significant difference between students' daily tea-coffee consumption and sleep quality ( $p = 0.002$ ). Daily tea and coffee consumption of individuals with poor sleep quality (median: 350 ml, min-max: 0-3050 mL) was found to be higher than those with good sleep quality (median: 300 ml, min-max: 0-2400 mL) (not shown in table).

Table 2. Comparison of descriptive features and sleep qualities								
	Poor sleep quality (n=703)		Good sleep quality (n=341)		Total (n=1044)		p	
	n	%	n	%	n	%		
<b>Gender</b>								
Female	474	67	243	71	717	69	0.210	
Male	229	33	98	29	327	31		
<b>BMI</b>								
Underweight	98	14	35	10	133	13	0.030	
Normal	456	65	252	74	708	68		
Overweight	115	16	44	13	159	15		
Obese	34	5	10	3	44	4		
<b>Use of antidepressant</b>								
Yes	41	6	4	1	45	4	<0.001	
No	662	94	337	99	999	96		
<b>Skipping breakfast</b>								
Yes	240	34	57	17	297	28	<0.001	
No	463	66	284	83	747	72		
<b>Study duration per day</b>								
< 1 hour	43	6	14	4	57	6	0.418	
1-2 hours	205	29	112	33	317	30		
3-4 hours	234	33	110	32	344	33		
> 4 hours	221	32	105	31	326	31		
Chi-square								

Table 3 shows food addiction status and night eating syndrome of students by sleep quality. There were significant differences between both food addiction status ( $p < 0.001$ ), night eating syndrome ( $p < 0.001$ ) and sleep quality. Among students with poor sleep quality, 26% of them had food addiction and 16% of them had night eating syndrome.

Table 3. Relationship between sleep quality and night eating syndrome and food addiction					
	Poor sleep quality (n=703)		Good sleep quality (n=341)		p
	n	%	n	%	
<b>Food Addiction</b>					
Yes (n=224)	184	26	40	12	<0.001
No (n=820)	519	74	301	88	
<b>Night Eating Syndrome</b>					
Yes (n=123)	110	16	13	4	<0.001
No (n=921)	593	84	328	96	
Chi-square					

Students with poor sleep quality had a higher NEQ score (18.0) than students with good sleep quality (14.0). A weak positive correlation was found between The PSQI score and the NEQ score ( $r = 0.440$ ;  $p < 0.001$ ). As sleep quality of students decreased, the risk of night eating syndrome increased. The YFAS score of students with poor sleep quality (3.0) was found to be higher than the students with good sleep quality (2.0). A weak positive correlation was found between the PSQI score and the YFAS score ( $r = 0.278$ ;  $p < 0.001$ ). As sleep quality of students decreased, food addiction increased (not shown in table).

### Discussion

Of the 1044 students studied, 67% reported poor sleep quality, a finding similar to that in other studies of Turkish students. Those with higher BMI, using antidepressants and with food addiction and night eating syndrome were more likely to have poorer sleep quality.

In studies with Turkish university students found the rates of poor sleep quality within the range of 46-59% (18, 19) and these findings were similar with our study. Although the effect of gender on sleep has not been fully determined in the literature, in our study, it was found that

67.4% of those with poor sleep quality were female and 32.6% were male. However, the relationship between gender and sleep quality was not statistically significant ( $p>0.05$ ).

In two different studies conducted to determine sleep quality, women experience more sleep problems than men (9, 20). Although there was no statistically significant result, the majority (67%) of those with poor sleep quality in our study were female students, similar to other studies.

Some claim that sleep quality is associated with a high BMI (21). Although some of the studies in the literature found that anthropometric measurements differed according to sleep quality but these were not statistically significant (22, 23). In addition, it was seen that insufficient sleep was associated with many metabolic diseases as well as obesity (24). On the other hand, those who slept for a long time were also more likely to be overweight or obese (25). In our study, there was a significant difference between sleep quality and BMI ( $p=0.03$ ), and the majority of participants with good sleep quality (74%) were in the normal BMI range. In addition, overweight ( $p=0.005$ ) and obese individuals ( $p=0.002$ ) had statistically worse sleep quality than individuals with normal BMI.

In a study, university students had poor sleep quality with the reasons for this; factors such as exam periods, long study periods, delays in classes in certain periods and, on the other hand, more intense work in certain periods have been shown (26). Although there was no significant difference between study duration and sleep quality in our study ( $p>0.05$ ); it was determined that 33% of those with poor sleep quality studied for 3-4 hours a day and only 6% studied for less than 1 hour a day.

One study reported that consuming beverages containing caffeine such as tea and coffee did not have any effect on sleep quality (18). However, in a study of university students, when the relationship between caffeinated beverage consumption and sleep quality was evaluated, there was a significant relationship between caffeinated beverage consumption and sleep quality scores (9). In another study conducted on medical school students, sleep quality of individuals who took caffeinated beverages was significantly worse than those who did not (27). In a study conducted in Taiwan, drinking tea more than three times

a week was associated with poor sleep quality, but coffee drinking was not (28). In our study as the daily tea and coffee consumption of the students increased, the sleep quality decreased significantly ( $p=0.002$ ), in parallel with the results of similar studies in the literature.

Short sleep duration and poor quality can affect the food preferences, meal consumption and eating attitudes of individuals. Eating attitude disorders also cause sleep-related problems, reduce the duration of sleep, and cause problems in the initiation and continuity of sleep. In our study, a significant relationship was found between food addiction and sleep quality ( $p<0.001$ ). While food addiction was 26% in students with poor sleep quality, it was 12% in students with good sleep quality. Moreover, as sleep quality decreased, food addiction increased ( $r=0.278$ ;  $p<0.001$ ). In a study conducted with 536 undergraduate nursing students those with food addiction had worse sleep quality (29).

Night eating syndrome affects the sleep pattern and quality of the individual, insomnia is frequently mentioned in the diagnostic criteria. Nocturnal eating attacks occur during N-REM sleep (non-rapid eye movement – also known as quiescent sleep) and this situation negatively affects sleep quality. Those with night eating syndrome have a deterioration in sleep and eating patterns and shifts in the biological clock of eating. In addition, it was noted that there was a significant improvement in sleep quality in individuals whose night eating complaints were controlled (30). In our study, a significant relationship was found between night eating syndrome and sleep quality ( $p<0.001$ ). Night eating syndrome is seen in 16% of participants with poor sleep quality. Ninety-six percent of the participants did not have night eating syndrome and had good sleep quality.

One of the strengths of our study is that our sample size was quite sufficient. Thus, it makes it possible to obtain information about sleep quality, night eating habits and food addictions among different universities in Turkey. On the other hand, one of the limitations of our study might be the time of administering the questionnaires to the students. If the same study had been done in 2 different times, both during the semester and during the exam week, the difference in sleep quality depending on the time devoted to study could have been observed better.

## Conclusion

In conclusion, the sleep quality of students with food addiction and/or night eating syndrome may be poorer. While night eating syndrome can negatively affect sleep quality, poor sleep quality can also increase the risks of night eating syndrome and food addiction. In this context, students' having healthy eating behaviors, gaining awareness of food addiction and night eating syndrome can affect the sleep quality of the students positively.

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## Declarations

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### Conflict of interest

The authors declare that there is no conflict of interest.

### Ethical approval

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human participants were approved by the Marmara University Faculty of Health Sciences Non-Invasive Clinical Studies Ethics Committee; 30.12.2020/86.

### Availability of data and material

Available upon request.

### Author contributions

A.H.I. and G.S. performed all literature review, statistical analyses and contributed to writing the manuscript, all authors reviewed and commented on subsequent drafts of the manuscript.

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