

The Prevalence of Energy Drink Consumption Among High School Students; Evaluation of the Effects on Perceived Stress and Sleep Quality

Lise Öğrencileri Arasında Enerji İçeceği Kullanım Sıklığı: Algılanan Stres ve Uyku Kalitesine Olan Etkilerini Araştırılması

Kursat Bora CARMAN¹, Didem ARSLANTAS², Meltem DINLEYİCİ¹, Alaettin UNSAL²,
Hatice AYGAR², Sevil AKBULUT², Burcu ATALAY², Aziz SOYSAL², Gökçe DAGTEKİN²,
Sevil AYDOĞAN²

¹Eskişehir Osmangazi University, Department of Pediatrics, Eskişehir, Turkey

²Eskişehir Osmangazi University, Department of Public Health, Eskişehir, Turkey



ABSTRACT

Objective: The aim of this study was to evaluate the prevalence of energy drink consumption and its effects on perceived stress and sleep quality among high school students.

Material and Methods: In this cross-sectional study was conducted with 2806 students. The first part of specific survey investigated the sociodemographic characteristics and the energy drink consumption habits of students. The perceived stress scale and the Pittsburgh Sleep Quality Index (PSQI) were performed.

Results: The mean age of students was calculated as 15.73 ± 1.16 years. It was revealed that prevalence of energy drink consumption was 70.8%. Male sex, being a member of divorced family, irregular sleep habits, and believing that energy drinks are unhealthy & addictive were found to be significant factors affecting the frequency of energy drink usage.

The mean score of the students' Perceived Stress Scale was 28.95 ± 7.22 and the mean score of the PSQI was 6.56 ± 2.84. Perceived Stress Scale and PSQI scores of consumer students were higher than non-consumers.

Conclusion: Energy drink consumption was found to be quite frequent in the study group. Consumption of energy drinks negatively affected the level of stress and sleep quality. Educational programs should be provided to students on the harmful effects of these beverages.

Key Words: Children, Energy drink, Frequency, Sleep quality, Stress

ÖZ

Amaç: Bu çalışmanın amacı lise öğrencileri arasında enerji içeceği tüketim sıklığını ve bu durumun algılanan stres ve uyku kalitesi üzerine olan etkilerini araştırmaktır.



CARMAN KB : 0000-0002-4629-1873
ARSLANTAS D : 0000-0002-5263-3710
DINLEYİCİ M : 0000-0002-8353-6796
UNSA A : 0000-0001-8353-1605
AYGAR H : 0000-0001-6277-7753
AKBULUT S : 0000-0002-5308-9737
ATALAY B : 0000-0001-9149-6424
SOYSAL A : 0000-0002-6557-5441
DAGTEKİN G : 0000-0002-6424-2434
AYDOĞAN S : 0000-0002-7314-5900

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Contribution of the Authors / Yazarların katkısı: **CARMAN KB:** Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Taking responsibility in logical interpretation and conclusion of the results, Taking responsibility in necessary literature review for the study, Taking responsibility in the writing of the whole or important parts of the study, Reviewing the article before submission scientifically besides spelling and grammar, Providing personnel, environment, financial support tools that are vital for the study, Biological materials, taking responsibility of the referred patients. **ARSLANTAS D:** Constructing the hypothesis or idea of research and/or article, Planning methodology to reach the Conclusions, Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in logical interpretation and conclusion of the results, Taking responsibility in necessary literature review for the study. **DINLEYİCİ M:** Constructing the hypothesis or idea of research and/or article, Taking responsibility in necessary literature review for the study. **UNSA A:** Organizing, supervising the course of progress and taking the responsibility of the research/study, Taking responsibility in the writing of the whole or important parts of the study. **AYGAR H:** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. **AKBULUT S:** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. **ATALAY B:** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. **SOYSAL A:** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. **DAGTEKİN G:** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments. **AYDOĞAN S:** Taking responsibility in patient follow-up, collection of relevant biological materials, data management and reporting, execution of the experiments.

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Correspondence Address / Yazışma Adresi:

Kursat Bora CARMAN
Eskişehir Osmangazi University, Department of Pediatrics, Eskişehir, Turkey
E-posta: kbcarman@gmail.com

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Gereç ve Yöntemler: Kesitsel tipteki bu çalışmaya 2806 çocuk ile gerçekleştirildi. Hazırlanan anket formun ilk bölümü öğrencilerin sosyodemografik özelliklerini ve enerji içeceği tüketme durumları sorgulandı. Algılanan stres ve uyku kalite indeksleri uygulandı.

Bulgular: Öğrencileri ortalama yaşı 15.73 ± 1.16 yıl olarak hesaplandı. Enerji içeceği tüketim sıklığı %70.8 olarak belirlendi. Erkek cinsiyet, ayrılmış ailenin ferdi olmak, düzensiz uyku alışkanlığı, enerji içeceklerinin sağlıksız olduğunu ve bağımlılık yapıcı olduğunu düşünmek tüketim sıklığını etkileyen faktörler olarak saptandı. Ortama algılanan stres ve uyku kalite indeks puanları sırasıyla 28.95 ± 7.22 ve 6.56 ± 2.84 hesaplandı ve enerji içeceği tüketen öğrencilerin puanları tüketmeyenlere oranla daha yüksekti.

Sonuç: Bu çalışmada enerji içeceği tüketim sıklığı oldukça yüksek saptandı. Enerji içeceği kullanımı algılanan stres düzeyini ve uyku kalitesini olumsuz etkilemekteydi. Öğrencilere yönelik bu içeceklerin zararlı etkilerini anlatacak eğitim programları hazırlanmalıdır.

Anahtar Sözcükler: Çocuk, Enerji içeceği, Sıklık, Uyku kalitesi, Stres

INTRODUCTION

Energy drinks (EDs) are consumed to provide mental alertness, increase endurance and energy, reduce fatigue, accelerate metabolism, and improve physical performance (1). The Turkish Food Codex Regulation defines EDs as flavored soft drinks containing taurine, glucuronolactone, inositol, carbohydrates, amino acids, vitamins, and other components (2). The caffeine content of these drinks should not exceed 150 mg/L (2). Although this value varies according to which brands are available on the market, EDs contain amounts of caffeine in the range of 70–240 mg (3, 4). Goren and Daglı (5) examined the amount of caffeine in 16 samples of three different brands of EDs on the market. In these samples, the amount of caffeine varied between 86.7–272 mg/L (median 172.7 mg/L). The caffeine concentration was above the acceptable limit (150 mg/L) in 13 out of the 16 samples that were examined.

The chemical structure of caffeine is similar with that of adenosine; it inhibits the adenosine receptor and increases catecholamine secretion. Its effects start within 15–60 minutes. Caffeine is defined as the only legally sold psychoactive drug available to children (6,7). Acute side effects such as nervousness, headache, hypertension, tachycardia, seizures, nausea, and vomiting may be seen in ED users. In addition, studies have shown that consuming EDs with alcohol increases the side effects of EDs (8). Sleep disorders are also common problems among individuals that consume EDs. It has been found that sleep problems are 3.6 times more common among ED users, who typically slept later and experienced shorter periods of total sleep time, compared to people who did not consume EDs (9).

The aim of this study was to evaluate the effects of ED consumption frequency on perceived stress and sleep quality among high school students.

MATERIALS and METHODS

This cross-sectional study recruited 2.806 high school students in Eskisehir between November 1 and December 31, 2018. Eskisehir, a province of Turkey, is the 25th most crowded city. According to data from the Turkey Statistical

Institute, the population aged 15–19 years includes 60.020 (6.97%) members, of which 30.831 (51.36%) are male and 29.189 (48.63%) are female (10). According to the data from the Ministry of Education, a total of 52.277 students—26.755 (51.1%) males and 25.522 (48.8%) females—are attending high schools (11).

Seven high schools (3 private, 3 state and 1 technical schools) were selected randomly and students attending those schools were invited to participate.

For the purposes of this study, a questionnaire form was prepared with the help of literature review (3–5, 7, 9, 12–20). This questionnaire consists of three parts. The first part contains items concerning sociodemographic characteristics as well as items thought to be related to ED consumption. The second part contains items of the Perceived Stress Scale (PSS). Finally, the third part contains items of the Pittsburg Sleep Quality Index (PSQI).

The PSS was used to assess students' stress levels. This scale was developed by Cohen and colleagues in 1983, and the validity and reliability of the Turkish version were studied by Eskin et al. in 2013 (21, 22). This scale consists of 14 questions, each with a 5 Likert-type scale. An increase in the scale score corresponds to an increase in stress level.

The PSQI was used to assess sleep quality. This scale was developed by Buysse et al. in 1989 (23), and the validity and reliability of the Turkish version were studied by Agargün et al. (24) in 1996. It evaluates the sleep quality of last month and is composed of 18 items in 7 major components which searches sleep quality, sleep delay, sleep duration, habitual sleep activity, sleep disturbance, sleep medication uses and daytime function disorder. The total score may range from 0 to 21. Higher scores on this scale indicate impaired sleep quality.

The family income level of each student was evaluated as bad, moderate, or good according to the student's perception. People engaging in exercise, such as walking, for at least 30 minutes each day were considered to exercise regularly (i.e., considered to be physically active). Those who had consumed at least one ED (can or bottle) in their lives were considered to consume EDs. Written informed consent was obtained from participants.

Statistical Analysis

A statistical analysis program was used to evaluate data by carrying out a chi-squared test and a Mann Whitney–U analysis. Odds ratio (OR) and 95% confidence intervals were obtained by using univariate and multivariate logistic regression analysis to analyze the differences between groups. Statistical significance was set at $p < 0.05$.

All study procedures were approved by the local ethical committee of university (29.03.2018/ 25403353-050.99-E.33260/81).

RESULTS

A total of 2.806 students participated in this study. The ages of the participants ranged between 14–19 years, and the

mean age was 15.73 ± 1.16 years. The results showed that the prevalence of regular tea consumption was 72.2%, the prevalence of carbonated beverage consumption was 46.9%, and the prevalence of coffee consumption was 18%. It was found that 70.8% of the participants had consumed EDs at least once in their lifetimes. The sociodemographic features of these students are provided in Table I.

Six hundred fifty-nine participants reported that they consumed one or more EDs per month. The mean age of ED consumption was 12.01 ± 2.23 years. Results also revealed that 7.8% of students were consuming EDs with alcohol and that the most common reason for ED consumption was taste (Figure 1).

When asked about health problems associated with ED consumption, 7.8% of the participants stated that they had a relevant health complaint. The distribution of health complaints is shown by Figure 2.

Table I: Sociodemographic feature of students.

	n	%
Gender		
Female	1346	48.0
Male	1460	52.0
Age		
< 16 years old	1978	70.5
> 16 years old	828	29.5
Type of family		
Narrow	2285	81.4
Extended	360	12.8
Divorced	161	5.7
Financial status of family		
Good	886	31.6
Medium	1852	66.0
Low	68	2.4
Tea consumption		
No	779	27.8
Yes	2027	72.2
Coffee consumption		
No	2301	82.0
Yes	505	18.0
Carbonated beverage consumption		
No	1490	53.1
Yes	1316	46.9
Regular exercise		
No	1375	49.0
Yes	1431	51.0
Regular sleep habit		
Yes	1302	46.4
No	1504	53.6
Thinking that energy drinks are unhealthy		
Yes	2287	81.5
No	519	18.5
Thinking that energy drinks cause addiction		
Yes	1871	66.7
No	935	33.3
Total	2806	100.0

Table II: The results of univariate and multivariate analyses.

	n(%)	Univariate analysis OR (%95 GA)	Multivariate analysis OR (%95 GA)
Gender			
Female	1346 (48.0)	1	1
Male	1460 (52.0)	3.00*** (2.53 - 3.56)	2.56*** (2.12 - 3.10)
Age			
< 16 years old	1978 (70.5)	1	
> 16 years old	828 (29.5)	1.198 (0.99 - 1.44)	
Type of family			
Narrow	2285 (81.4)	1	1
Extended	360 (12.8)	0.84 (0.66 - 1.06)	0.71* (0.54 - 0.92)
Divorced	161 (5.7)	2.39*** (1.53 - 3.72)	1.88** (1.88 - 1.17)
Tea consumption			
No	779 (27.8)	1	
Yes	2027 (72.2)	1.97*** (1.12 - 1.60)	
Coffee consumption			
No	2301 (82.0)	1	1
Yes	505 (18.0)	1.49** (1.19 - 1.87)	1.49** (1.16 - 1.93)
Carbonated beverage consumption			
No	1490 (53.1)	1	1
Yes	1316 (46.9)	2.56*** (2.16 - 3.05)	1.98*** (1.63 - 2.39)
Regular exercise			
Not perform	1375 (49.0)	1	
Perform	1431 (51.0)	1.24** (1.05 - 1.46)	
Regular sleep habit			
Yes	1302 (46.4)	1	1
No	1504 (53.6)	1.49*** (1.26 -1.75)	1.65*** (1.37 -1 .98)
Thinking that energy drinks are unhealthy			
Yes	2287 (81.5)	1	1
No	519 (18.5)	5.38*** (3.91 - 7.39)	3.10*** (2.21 - 4.34)
Thinking that energy drinks cause addiction			
Yes	1871 (66.7)	1	1
No	935 (33.3)	4.99*** (3.99 - 6.26)	3.79*** (2.99 - 4.81)

* $p \leq 0.05$, ** $p \leq 0.01$, *** $p \leq 0.001$

Table III: The scores of Perceived Stress Scale and Pittsburgh Sleep Quality Index in the study group.

Energy drink consumption	PSQI Median (min – max)	PSS Median (min - max)
Yes	7.0 (0.0 - 19.0)	29.0 (6.0 - 56.0)
No	6.0 (0.0 - 15.0)	28.0 (6.0 - 52.0)
z ; p	5.240; ≤ 0.001	2.471 0.013

PSQI: Pittsburg Sleep Quality Index, **PSS:** Perceived Stress Scale

The results of the logistic regression analysis showed that gender, family type, family income, tea consumption, coffee consumption, carbonated beverage consumption, regular exercise, regular sleep, and the belief that EDs are unhealthy and addictive were all independent factors related to energy drink consumption.

A multiple logistic regression analysis found that energy drink consumption was higher among students who were male, lived in broken families, consumed coffee and carbonated beverages, had irregular sleep, did not consider EDs to be unhealthy, or did not think that EDs were addictive. Table II

provides univariate and multivariate analysis results regarding the variables that affected the ED consumption status of the students in the study group.

An evaluation of the perceived stress level and sleep quality of each participant yielded the following results. The students' scores on the PSS ranged from 6.00–56.0, and their mean score was 28.95 ± 7.22 . The students' scores on the PSQI ranged from 0.00–19.0, and their mean score was 6.56 ± 2.84 . There was a statistically significant ($p < 0.05$) difference between the PSS and PSQI scores of students who consumed EDs and the scores of those who did not consume EDs (Table III).

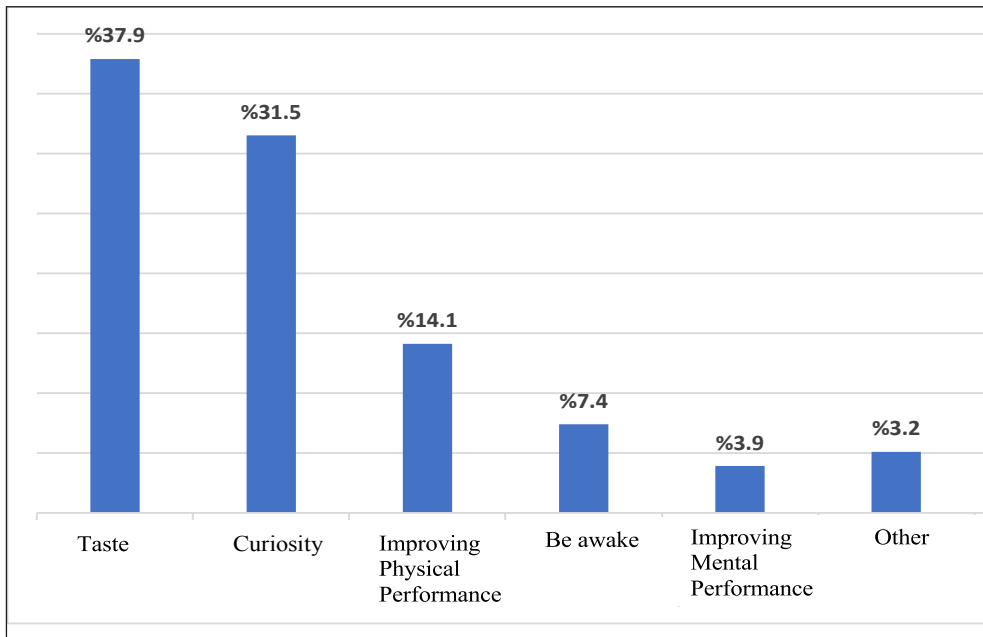


Figure 1: Reason of ED consumption

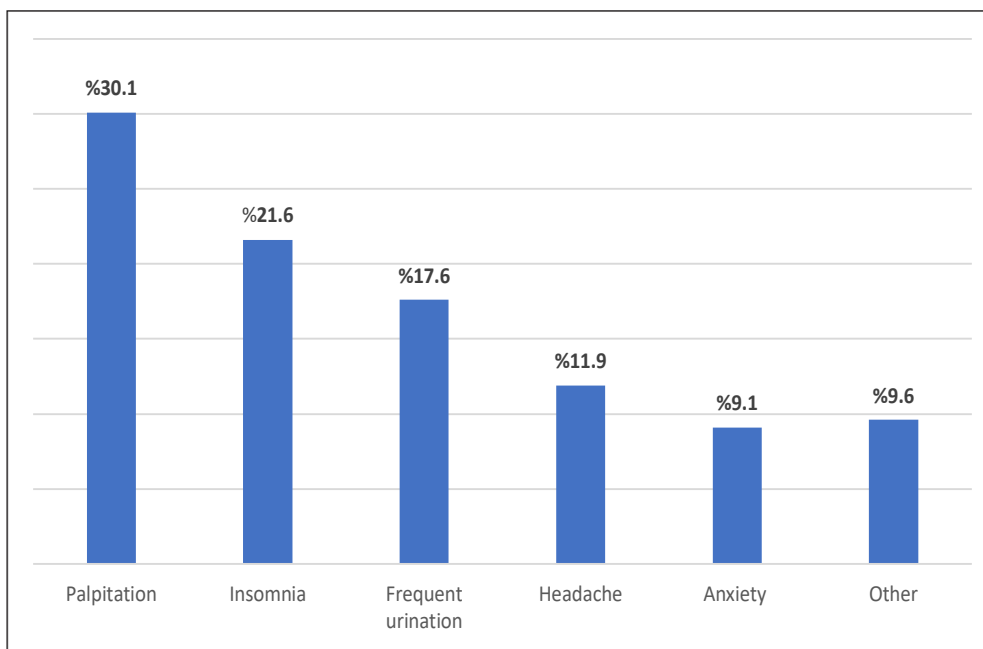


Figure 2: Health complaints of ED consumers.

DISCUSSION

In recent years, ED usage has been increasing both in Turkey and across the world. A study conducted in the UK found that ED consumption had increased by 155% between 2006 and 2014 (25). Studies conducted in the United States, Norway, and Portugal determined that the frequency of ED consumption was between 33% and 56.7% (4, 26, 27). The Turkish Food Codex Communiqué on Energy Drinks recommends not allowing children to consume EDs (2). In Turkey, 78% of university students have consumed EDs at least once in their

lives, and 2% use EDs regularly (28). A meta-analysis revealed that the frequency of ED usage in Turkey is 54% (29). In our study, the percentage of participants who had used EDs at least once was 70.8%.

Children and adolescents comprise the main target group for these products. In order to reach children, ED manufacturers release intense advertisements and promotions. In a study of 2.040 students between the ages of 12–24, 83% of participants had seen at least one energy drink advertisement (especially on television), and 97% of them knew of at least one beverage brand (31). In order to draw attention to these increasing ED

consumption rates, the American Academy of Pediatrics reported in 2011 that energy drinks have no place in child and adolescent nutrition (30).

In the present study, ED consumption was higher among students who were male, lived in broken families, consumed coffee and carbonated beverages, or had irregular sleep patterns. The present study revealed that being male was a prominent risk factor for ED consumption, similar to results of previous literature (4, 26, 27). In addition, misbeliefs about ED, that ED is not unhealthy, not have addictive effects, were found to be factors affecting the frequency of use. A study conducted in Israel showed that students decreased the frequency of consumption after get information EDs (32). These findings indicate that informing students about the contents of EDs might change their consumption habits.

Although energy drinks are mainly used to increase physical and mental performance, 37.9% of the students in our research group stated that they consumed energy drinks because they liked the taste. A study conducted in Portugal found that 49% of the participants liked the taste of Eds and 33% of the participants used Eds to improve their physical performance (27).

In addition, EDs can be consumed with alcohol (25-28). Our results showed that 7.8% of the students drank EDs with alcohol. In the literature, it is stated that not only alcohol use but also drug use is higher among students who consume EDs. It has also been shown that psychiatric disorders are more common among adolescents who consume EDs (12, 33). Also, Kim SY et al. (34) reported that the risk of suicide was 3.03 times higher in young people who used EDs. The present study was not aimed to get information about suicidal ideation.

One of the main results of the present study was related to the effects of energy drinks on stress level and sleep quality. A study reported that ED consumption frequency was 1.42 times higher in adolescent to sleep after 11 pm (35).

Most of the studies that have questioned the effects of energy drinks on sleep quality have only evaluated sleep disturbance based on the participants' self reports (33, 36, 37). Similar with the present study, Sawah MA et al. (37) reported that ED consumption increased the risk of stress disorder 1.2-fold and increased the risk of sleep disorders 3.6-fold (38).

There were some limitations to the present study. In this study, those who had drunk energy drinks at least once in their lives were considered as ED consumers. This point might affect the results. In addition, the present survey was conducted in city center. The rural parts of Eskisehir were not involved into research area. It might be speculated that the prevalence of EDS consumption might be lower than city center. This point might be considered as a limitation of study.

In conclusion, the present study found that ED use was high among high school students and that high ED use negatively affected the sleep quality of these students, leading to increased stress levels. It would be beneficial to provide educational programs on the negative effects of these drinks to students, teachers, and the broader community.

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