

Consumption of Energy Drinks among University Students in Türkiye: A Cross-Sectional Study

Elif Didem ÖRS DEMET^{1*}  Zehra Buse BALCIK¹  Melike DURSUN¹ 
Merve Nur AYAN¹  Şenay Burçin ALKAN¹ 

¹ Department of Nutrition and Dietetics, Nezahat Keleşoğlu Faculty of Health Sciences, Necmettin Erbakan University, Konya, Türkiye

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ABSTRACT

This cross-sectional study meticulously investigates the consumption of energy drinks among university students aged 18-25 at Necmettin Erbakan University in Turkey and examines the effects of this consumption on the students' health. Of the 375 students who participated in the study, 40.5% reported consuming energy drinks, with a notably higher prevalence among male students. The primary reasons for their preference include flavor choices and brand loyalty, significantly influenced by social media. The study reveals positive correlations between energy drink consumption and other risky behaviors such as alcohol and cigarette use, as well as physical activity. It is concerning that, despite a broad awareness of the potential health risks associated with energy drinks, many students lack a proper understanding of product labels. This deficiency is alarming, especially considering the links between energy drink consumption and harmful behaviors like alcohol and tobacco use. Furthermore, the research documents that 72% of the students consuming energy drinks experience severe health issues such as sleep disturbances, gastrointestinal problems, and cardiovascular symptoms. However, only 33.3% of them regularly read product labels, exacerbating the negative health impacts. It has been determined that students have inadequate knowledge about the ingredients of energy drinks; only a small portion are aware that these beverages contain sugar, caffeine, acid regulators, and minerals. These findings underscore the urgent need to enhance educational campaigns and improve labeling regulations to increase awareness about the health effects of energy drinks and to make consumer choices safer. The research highlights the critical role of targeted public health interventions and policy changes in understanding sustainable dietary behaviors among young adults and reducing energy drink consumption among university students.

Türkiye'de Üniversite Öğrencileri Arasında Enerji İçeceği Tüketimi: Kesitsel Bir Çalışma

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ÖZET

Bu kesitsel çalışma, Türkiye'deki Necmettin Erbakan Üniversitesi'nde 18-25 yaş arası üniversite öğrencileri arasında enerji içeceği tüketimini ve bu tüketimin öğrencilerin sağlığı üzerindeki etkilerini detaylı bir şekilde incelemektedir. Araştırmaya katılan 375 öğrenciden %40,5'i enerji içeceği tükettiğini bildirmiş, bu tüketimin özellikle erkek öğrenciler arasında daha yaygın olduğu gözlemlenmiştir. Öğrencilerin enerji içeceklerini tercih etme nedenleri arasında lezzet tercihleri ve marka bağlılığı öne çıkmakta, bu faktörlerin büyük ölçüde sosyal medya aracılığıyla etkilendiği belirlenmiştir. Enerji içeceği tüketimi, alkol ve sigara kullanımı gibi diğer riskli davranışlarla ve fiziksel aktivite ile pozitif ilişkiler göstermiştir. Araştırma, öğrencilerin enerji içeceklerinin potansiyel sağlık risklerinden geniş çapta haberdar olmalarına rağmen, ürün etiketlerini doğru bir şekilde anlama konusunda yetersiz bilgiye sahip olduklarını ortaya koymuştur. Bu durum, alkol ve tütün kullanımı gibi zararlı davranışlarla enerji içeceği tüketimi arasındaki ilişkileri göz önüne alındığında endişe vericidir. Çalışma ayrıca enerji içeceği tüketen öğrencilerin %72'sinin uyku bozuklukları, gastrointestinal rahatsızlıklar ve kardiyovasküler semptomlar gibi ciddi sağlık sorunları yaşadığını belgelemiştir. Ancak yalnızca %33,3'lük bir kesim düzenli olarak ürün etiketlerini okumakta, bu da sağlık üzerindeki olumsuz etkileri daha da artırmaktadır. Öğrencilerin enerji içeceklerinin içerdiği maddeler hakkında yeterli bilgiye sahip olmadıkları; sadece az bir kısmının içeceklerin şeker, kafein, asit düzenleyiciler ve mineraller içerdiğini bildiği saptanmıştır. Bu bulgular, enerji içeceklerinin sağlık üzerindeki etkilerine dair farkındalığı artırmak ve tüketici tercihlerini daha bilinçli ve güvenli hale getirebilmek için eğitim kampanyalarının ve etiketleme düzenlemelerinin güçlendirilmesinin zorunlu olduğunu vurgulamaktadır. Araştırma, genç yetişkinlerin sürdürülebilir diyet davranışlarını daha iyi anlamak ve üniversite öğrencileri arasında enerji içeceği tüketimini azaltmak için hedeflenmiş halk sağlığı müdahalelerinin ve politika değişikliklerinin kritik bir rol oynadığını ortaya koymaktadır.

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*Sorumlu Yazar: Elif Didem ÖRS DEMET, edors@erbakan.edu.tr



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INTRODUCTION

Energy drinks are soft drinks containing high levels of caffeine and other psychoactive substances. They are consumed because they are believed to enhance physical strength and mental alertness (Cholewa et al., 2023). Typically, energy drinks include caffeine, guarana, ginseng, carnitine, taurine, choline, vitamin C, B vitamins (vitamins B₁, B₂, B₃, B₅, B₆, B₉, and B₁₂), vitamin A (beta carotene), vitamin D, and electrolytes (potassium, sodium, calcium, and magnesium), as well as sugars (sweeteners with or without calories), tyrosine, and L-theanine (Jagim et al., 2022). Reports indicate significant differences in energy drink consumption across age groups, with up to 75% of adolescents and young adults regularly consuming them. This demographic particularly uses energy drinks to improve academic performance, achieve sports success, and aid in sustainable weight loss (Aonso-Diego et al., 2024; Molu & Hisar, 2021).

Among 2165 undergraduate students in Italy, the rate of energy drink consumption was found to be 15.2%. Higher consumption rates were reported among male students, those enrolled in life sciences programs, and those living in university areas (Protano et al., 2023). Another study among university students revealed that energy drink consumption was more prevalent among those who engaged in sports and smoked (Akduran et al., 2023; Göney et al., 2020; Pavlović et al., 2023). In a survey of 749 university students, the primary reasons given for drinking energy drinks were mentioned as the need to stay awake longer, aid in studying, and sustainably increase energy levels. Most participants were aware that energy drinks include sugar and caffeine, and may also include amino acids and herbal extracts. Nevertheless, numerous individuals were unaware that these beverages might also include L-carnitine, vitamins, and minerals (Thiab et al., 2023).

Energy drink use has emerged as a significant public health concern over the past few years. Despite assertions of safety and benefits, energy drinks have been linked to severe cardiovascular-related outcomes, including atrial and ventricular myocardial infarctions, arrhythmias, cardiomyopathies, and cardiac death (Kaur et al., 2022). The aim of this study was to determine the frequency of energy drink consumption among students aged 18-25 years at Necmettin Erbakan University and to evaluate the factors influencing their consumption.

METHODS

Study Design and Sample Size

This study was designed as a cross-sectional analysis to examine the energy drink consumption habits of male and female students aged 18-25 at Necmettin Erbakan University. The sample size was established at a minimum of 364 students, calculated based on a 59.9% rate of energy drink consumption and a 95% confidence level as determined by Bahadırılı et al. (Bahadırılı et al., 2018). A total of 375 students were recruited for this study. Data collection was completed between December 2023 and April 2024.

Survey Development, Validation, and Data Collection

Data collection was conducted using a self-administered online survey, which was developed with Google Forms. The survey was validated after selecting appropriate questions from previous similar studies (Itany et al., 2014; Thiab et al., 2023; Trapp et al., 2014) to ensure anonymity and confidentiality of the responses. An overview of the research and a statement of consent were presented at the start of the survey. The study was open to any students from Necmettin Erbakan University in Konya who were interested in participating. Recruitment of participants was carried out via social media channels like Facebook, WhatsApp, and Twitter.

Data were collected using an online questionnaire consisting of 25 questions. The questionnaire included inquiries about the participants' gender, age, department of education, source of income, place of accommodation, smoking and alcohol consumption status, energy drink consumption status and frequency, perceived health effects of energy drinks, factors considered when choosing energy drinks, and knowledge of labeling and content. Consent was obtained from the participants online.

Statistical Analyses

The data obtained from this research were evaluated using the SPSS 29.0 software. Means, standard deviations, and minimum and maximum values were calculated for quantitative data, while frequencies and percentages were tabulated for qualitative data. In the statistical analysis, parametric tests were applied to normally distributed data, and non-parametric tests were used for data that did not follow a normal distribution. For quantitative data, the Student's t-test was used to assess the significance of differences between the means of two independent groups when data were normally distributed. The Mann-Whitney U test was applied to non-normally distributed data. The Chi-square test was used to compare qualitative data between groups. When examining correlations among quantitative data, the Pearson correlation coefficient was used for normally distributed data, and the Spearman correlation coefficient was used when the distribution was not normal. Results were considered at a 95% confidence interval. Values with $p < 0.05$ were considered statistically significant (Alpar, 2016).

RESULTS

Characteristics of Participants

A total of 375 participants completed the survey. The general characteristics of the participants are presented in Table 1. There was a balance between female and male participants, at 50.9% and 49.1% respectively. The mean age of the university students was 20.9 ± 1.78 years. Most of the participants were of normal weight (68.5%) and were majoring in health sciences (70.9%). The students primarily lived in dormitories (53.6%), and the majority were financially dependent on their parents and scholarships (52.5%). Most of the participants did not have any chronic diseases (68.0%), did not engage in sports (57.9%), and did not use medication regularly (68%). Additionally, the majority of students were non-smokers (70.4%) and did not consume alcohol (76.5%).

Table 1
Characteristics of The Study Participants (n=375)

Variable	n	%
Gender		
Female	191	50.9
Male	184	49.1
BMI		
Underweight	39	10.4
Normal weight	257	68.5
Overweight	67	17.9
Obese	12	3.2
Field of study		
Health science	266	70.9
Social science	46	12.3
Engineering	63	16.8
Source of income		
Scholarship	34	9.1
Parents	108	28.8
Employment	16	4.3

Scholarship+ Parents	197	52.5
Scholarship+ Employment	20	5.3
Residential status		
Parents' house	116	30.9
Dormitory	201	53.6
Home by myself	22	5.9
Home with friends	36	9.6
Chronic disease		
Yes	120	32.0
No	255	68.0
Medicinal Use		
Yes	120	32.0
No	255	68.0
Playing sport		
Yes	158	42.1
No	217	57.9
Cigarette smoking		
Yes	111	29.6
No	264	70.4
Alcohol use		
No	287	76.5
Yes	88	23.5
Alcohol use frequency		
Every day	6	6.8
3–4 times/week	9	10.2
1–2 times/week	15	17.0
1–2 times/month	31	35.2
1–2 times/year	27	30.7

Consumption of energy drink

As shown in Table 2, of all the participants, 152 (40.5%) consumed energy drinks, with an average consumption of 366.8 ± 159.61 ml at one time. Among only the consumers, the most common reasons for consuming energy drinks were their good taste (48.7%), use as a mixer with alcohol (17.1%), and aiding concentration for studying (11.8%). Participants indicated that their primary sources of information regarding energy drinks came from social media (44.3%) and television (30.9%). The brand of the energy drink (40%) was the primary selection criterion, followed by taste (31.1%) and price (19.8%). 49.1% of the participants declared that energy drinks were harmful, and 30.9% stated that they were both harmful and helpful. Furthermore, most of the students (96.5%) asserted that energy drinks could cause diseases or metabolic problems, particularly cardiovascular (16.4%) and kidney diseases (16.4%), followed by diabetes (15.4%), and stomach and intestinal diseases (14.4%).

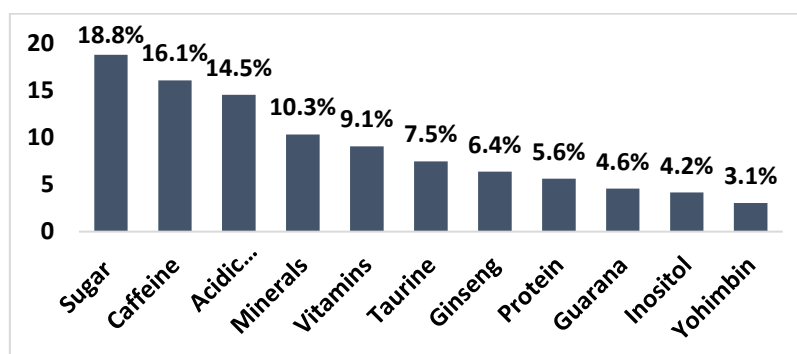
Table 2
Energy Drink Consumers' Habits

Variable	n	%
Energy drink user		
No	223	59.5
Yes	152	40.5
Reason for use it		
Helping concentration for studying	18	11.8
Improving efficiency in sport	11	7.2

Mixed with alcoholic drinks	26	17.1
Good tasting	74	48.7
Increasing mental health	7	1.9
Friends' consumption	16	10.5
Sources of information about energy drinks		
Television	17	30.9
Social media	166	44.3
Billboard	13	3.5
Shop/Supermarket	80	21.3
Energy drink selection criteria		
Brand	188	40
Taste	146	31.1
Price	93	19.8
Quantity/Size	43	9.1
Reading the label		
Yes	125	33.3
No	250	66.7
Opinion about energy drinks		
Harmful	184	49.1
Helpful	17	4.5
Both harmful and helpful	116	30.9
Undecided	58	15.5
Energy drinks cause disease/metabolic problems		
No	13	3.5
Yes	362	96.5
Water loss	148	12.3
Cardiovascular diseases	198	16.4
Kidney diseases	198	16.4
Nervous system diseases	141	11.7
Obesity	162	13.4
Diabetes	186	15.4
Stomach and intestinal diseases	174	14.4

Only 33.3% of the participants read labels, and as shown in Figure 1, a minority knew that energy drinks contain sugar (18.8%), caffeine (16.1%), acid regulators (14.5%), and minerals (10.3%). Additionally, a minority was aware that energy drinks could contain taurine (7.5%), protein (5.6%), and guarana (4.6%).

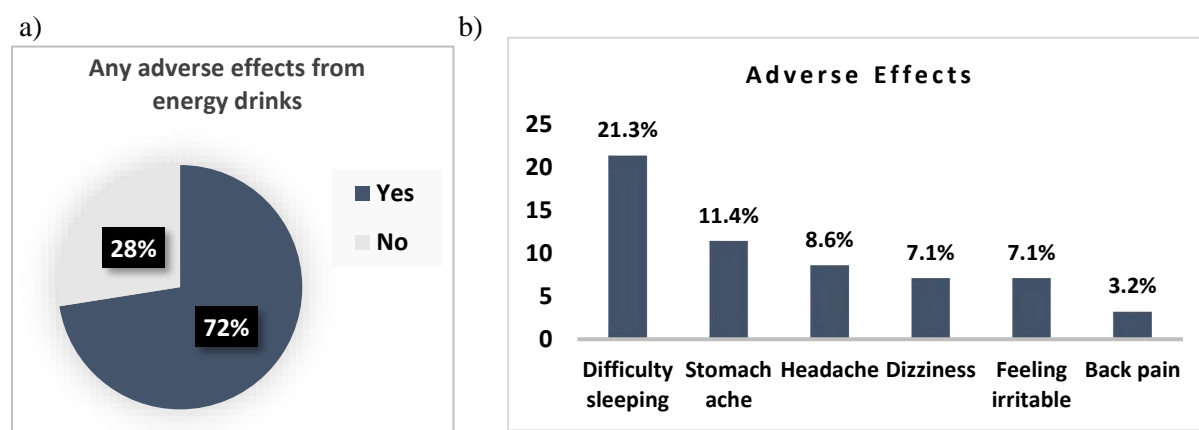
Figure 1
Participants' Knowledge About Energy Drinks' Ingredients



In the study's overall sample, 72% of those who consumed energy drinks reported negative effects, as illustrated in Figure 2a. Most of energy drink consumers reported difficulty sleeping (21.3%), stomach ache (11.4%), headache (8.6%), dizziness (7.1%), irritability (7.1%), and back pain (3.2%).

Figure 2

(a) Participants answers upon asking them if they had adverse effect after energy drinks consumption.
(b) Among the adverse effect, this graph demonstrates the most common types of adverse effect.



Regarding the correlations between the socio demographic characteristics and habits of energy drinks users, this study revealed that there was a positive correlation between male gender ($p < 0.001$), cigarette user ($p < 0.001$), alcohol user ($p < 0.001$), chronic disease ($p = 0.026$), and playing sport ($p = 0.008$) (Table 3). Finally, the study showed that there were no significant correlations between the energy drinks consumption and some other socio-demographic characteristics such as field of study ($p = 0.072$), residential status ($p = 0.435$), BMI groups ($p = 0.053$), medicinal use ($p = 0.076$), and source of income ($p = 0.074$).

Table 3

Participants' consumption of energy drinks according to their socio demographic characteristics and habits

	Energy drinks (n, %)		p value*
	Consumer	Non-consumer	
Gender			
Female	50 (26.2)	141 (73.8)	< 0.001
Male	102 (55.4)	82 (44.6)	
Field of study			
Health science	98 (36.8)	168 (63.2)	0.072
Social science	22 (47.8)	24 (52.2)	
Engineering	32 (50.8)	31 (49.2)	
Residential status			
Parents' house	44 (37.9)	72 (62.1)	0.435
Dormitory	81 (40.5)	120 (59.7)	
Home by myself	8 (36.4)	14 (63.6)	
Home with friends	19 (52.8)	17 (47.2)	
BMI			
Underweight	8 (20.5)	31 (79.5)	0.053
Normal weight	108 (42.0)	149 (58.0)	
Overweight	30 (44.8)	37 (55.2)	
Obese	6 (50.0)	6 (50.0)	

Cigarette smoking				
Yes	61 (55.0)	50 (45.0)	< 0.001	
No	91 (34.5)	173 (65.5)		
Alcohol use				
Yes	59 (67.0)	29 (33.0)	< 0.001	
No	93 (32.4)	194 (67.6)		
Chronic disease				
Yes	59 (49.2)	61 (50.8)	0.026	
No	93 (36.5)	162 (63.5)		
Medicinal Use				
Yes	57 (47.5)	63 (52.5)	0.076	
No	95 (37.3)	160 (62.7)		
Source of income				
Scholarship	12 (35.3)	22 (64.7)	0.074	
Parents	39 (36.1)	69 (63.9)		
Employment	7 (43.8)	9 (56.3)		
Scholarship+ Parents	80 (40.6)	117 (59.4)		
Scholarship+	14 (70.0)	6 (30.0)		
Employment				
Playing sport				
Yes	77 (48.7)	81 (51.3)	0.008	
No	75 (34.6)	142 (65.4)		

DISCUSSION

The present study at Necmettin Erbakan University revealed a substantial prevalence of energy drink consumption among students, with 40.5% reporting usage. This rate is consistent with global trends, however, slightly lower than previous studies (Pavlović et al., 2023; Protano et al., 2023; Thiab et al., 2023). Generally, the prevalent use of energy drinks is concerning, especially since young individuals are in a crucial stage of physical and mental growth and may not be aware of the potential health dangers of these drinks.

The demographic analysis shows a notable bias towards male consumers, with 55.4% of the participants being male. Considering the variations in energy drink consumption between genders, and noting that males generally consume more of these beverages than females, our research aligns with the findings of various international studies (Borlu et al., 2019; Galimov et al., 2019). This trend may be attributed to males generally being more inclined to experiment with new products compared to females.

This study reveals that participants primarily consume energy drinks for their flavor, to mix with alcohol, and to boost focus during study sessions. Similarly, previous studies have cited staying awake as the most frequent reason for consumption (Mahoney et al., 2019; Šljivo et al., 2020; Wiggers et al., 2017). In line with our results, another investigation pointed to flavor as the key motivator for use (Martins et al., 2018). The significance of taste as the primary reason suggests that the sensory experience of consuming energy drinks plays a crucial role in their use.

The most important selection criteria for energy drink were brand and social media were the major sources of information about these products. Social media not only serves as the main channel through which consumers receive information but also significantly shapes their preferences and purchasing decisions (Akcan et al., 2023). This strong linkage highlighted the power of digital platforms in driving brand loyalty and consumer behavior in the energy drink market.

This research indicated that a majority of our participants (66.7%) tend not to read labels on energy drinks, a figure that is higher than the one reported by other studies (Chang et al., 2017; Pavlović et al., 2023). This suggests that many consumers may be unaware of the potential risks associated with

these drinks if they do not consult the product labels. Nonetheless, half of the participants were aware of the health risks, including possible diseases or metabolic disorders, associated with energy drinks. Interestingly, their knowledge about the drinks was not reflected their use of these products. This underlines the need for stricter regulations and increased awareness regarding labeling.

In the present study energy drinks consumption is positively correlated with alcohol use, cigarette smoking, male gender, and those performing physical activity. This is consistent with numerous studies from different countries (Akgün et al., 2021; Alabbad et al., 2019; Borlu et al., 2019; Galimov et al., 2019), the profile of energy drinks users were similar (Chang et al., 2017; Fagan et al., 2020). The association of energy drink consumption with alcohol and smoking may be indicative of a broader pattern of behavior, where individuals who engage in one risk behavior are more likely to engage in others. Specifically, the association with alcohol may be partly due to the popular practice of mixing energy drinks with alcoholic beverages. This combination can be dangerous as it masks the sedative effects of alcohol, potentially leading to higher consumption and decreased awareness of intoxication levels. As previous research (Pavlović et al., 2023), smokers were found to be more likely to consume energy drinks compared to non-smokers. This correlation might be explained by the shared stimulating effects of nicotine and caffeine, both of which are psychoactive substances that can increase alertness and reduce fatigue. Smokers may use energy drinks to enhance these effects or to counteract the sedative aspects of nicotine withdrawal during periods of reduced smoking.

Furthermore, the relationship between energy drink consumption and physical activity is important to consider. While some users consume these drinks to enhance athletic performance and energy, the cardiovascular risks linked to their high caffeine and sugar content cannot be overlooked (Kaur et al., 2022). The consume of energy drinks among athletes and physically active students raises concerns about the cardiovascular strain from combined intense physical exertion and stimulant intake.

Concerning the knowledge of energy drinks among the students who participated, it was observed that a majority were aware of the presence of sugars and caffeine in these beverages, as well as the potential inclusion of acid regulators and minerals. However, as previous study (Thiab et al., 2023), a significant revelation surfaced: a considerable portion of the students demonstrated limited awareness regarding the presence of additional substances like L-carnitine, taurine, and guarana in energy drinks. This oversight underscores a broader trend of insufficient understanding among students concerning the comprehensive composition of the beverages they consume. Furthermore, only about a quarter of the participants were aware that energy drinks could lead to cardiovascular and kidney diseases. This indicates that there's a need to teach students more about what's in the drinks they consume and their potential health implications.

More than half of the consumers (72%) experienced certain symptoms after consuming energy drinks, consistent with findings from several other studies (Dwaidy et al., 2018; Tóth et al., 2020). Our study identified difficulty sleeping, stomach aches, and headaches as common symptoms. Similar reports have also highlighted insomnia (Hardy et al., 2021; Nordt et al., 2017), stomach aches (Nadeem et al., 2021) and headaches (Rahamathulla, 2017) as prevalent issues. A systematic review and meta-analysis on the adverse effects of energy drinks consumption identified insomnia as the most frequently reported effect (Nadeem et al., 2021). Many of the side effects associated with energy drinks can be attributed to their significant caffeine content. A standard serving, typically around 250 milliliters, contains between 80 and 141 milligrams of caffeine. While caffeine is known to have beneficial effects on performance by reducing feelings of fatigue, improving physical endurance, and enhancing motivation, it can also have adverse health effects. These include promoting diuresis, reducing insulin sensitivity, disrupting normal sleep patterns, raising mean arterial blood pressure, and potentially contributing to chronic daily headaches (Ariffin et al., 2022).

This study has a few important limitations that need careful consideration. First, the number of students surveyed at Necmettin Erbakan University is quite small compared to the total number of students. Also, since the survey was only conducted with students from Konya, the results might not represent what's true for the whole country. Moreover, the survey relied on students reporting their own behavior, which might lead to some inaccuracies in the data due to either exaggeration or underestimation. However, a strength of this study is that it's the first of its kind to look at energy drink consumption in Konya, providing a good starting point for more detailed studies with more students in the future.

CONCLUSION

This study analyzes the consumption of energy drinks among university students at Necmettin Erbakan University in Konya. It revealed a high prevalence of energy drink consumption, even though the participants recognized the associated health risks. Notably, males were more likely to consume these drinks, and their consumption was significantly correlated with other risk behaviors such as smoking and alcohol use. This correlation suggests a broader pattern of risk-taking behaviors that could be addressed through public health interventions.

The results highlight a critical gap in the awareness of the potential adverse health effects of energy drinks. Despite some level of awareness regarding their content, many students overlook the comprehensive health implications of these ingredients, which is concerning given the high consumption rates. Additionally, the study found a significant lack of label reading among consumers, suggesting that current labeling and educational strategies are inadequate.

RECOMMENDATIONS

Given the high rates of consumption and the associated health risks, there is a crucial need for comprehensive educational campaigns targeted at young adults. These campaigns should not only focus on the risks but also promote healthy alternatives to energy drinks for enhancing physical and cognitive performance. Future research should continue to monitor these trends and expand into longitudinal studies to better understand the long-term health impacts of energy drink consumption.

Ethical Statement

This study was conducted by Assist. Dr. Şenay Burçin Alkan and submitted on 23/11/2023, is derived from the undergraduate dissertation entitled "Üniversite Öğrencilerinde Enerji İçeceği Tüketimine Etki Eden Faktörlerin Değerlendirilmesi".

Ethical approval

The study was approved by the Necmettin Erbakan University Ethics Committee Commission, Konya (Approval number:18555).

Author Contributions

Research Design (CRediT 1) Elif Didem ÖRS DEMET (10%) - Zehra Buse BALÇIK (10%) - Melike DURSUN (10%) - Merve Nur AYAN (10%) - Şenay Burçin ALKAN (60%)

Data Collection (CRediT 2) Elif Didem ÖRS DEMET (0%) - Zehra Buse BALÇIK (30%) - Melike DURSUN (30%) - Merve Nur AYAN (30%) - Şenay Burçin ALKAN (10%)

Research - Data Analysis - Verification (CRediT 3-4-6-11) Elif Didem ÖRS DEMET (10%) - Zehra Buse BALÇIK (10%) - Melike DURSUN (10%) - Merve Nur AYAN (10%) - Şenay Burçin ALKAN (60%)

Writing the Article (CRediT 12-13) Elif Didem ÖRS DEMET (90%) - Zehra Buse BALÇIK (0%)

- Melike DURSUN (0%) - Merve Nur AYAN (0%) - Şenay Burçin ALKAN (10%)

Revision and Improvement of Text (CRediT 14) Elif Didem ÖRS DEMET (70%) - Zehra Buse BALÇIK (5%) - Melike DURSUN (5%) - Merve Nur AYAN (5%) - Şenay Burçin ALKAN (15%)

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Conflict of Interest

There are no conflicts of interest to declare

Sustainable Development Goals (SDGs)

Sustainable Development Goals: 3 Good Health and Well-Being.

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