

FREQUENCY OF CONSUMPTION AND STUDENTS' AWARENESS OF THE INGREDIENTS AND EFFECTS OF ENERGY DRINKS

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Abstract

Consumption of energy drinks has become increasingly common among the student population in recent years. The positive effects of consumption are the improvement of mental and physical endurance, while the side effects occur as a result of excessive intake and intoxication with caffeine, which is the main ingredient of energy drinks. The main goal of the work is to examine the frequency of consumption and students' awareness of energy drinks.

For this research, an anonymous questionnaire was made and used. The questionnaire consisted of 36 questions and statements. The research was conducted as a cross-sectional study in the period from 1st to 15th October 2022 at the High School of Medicine in Prijedor, Bosnia and Herzegovina. 65 students, of both sexes, with an average age of 22, participated in the study. Statistical data analysis was performed with the help of the SPSS statistical software package, version 26. The χ^2 -square test was used as the statistical test. As the level of statistical significance of differences, the usual value $p < 0.05$ was taken.

Of the total number of participants in the study, 75.4% stated that they sometimes consume energy drinks. On average, they consume 0.25 l of the beverage (78.5%), while 32.3% of the respondents felt side effects. Every third student (18.5) states that they occasionally consume alcohol with energy drinks.

Vulnerable groups should be influenced by education and legal regulations to reduce the frequency of use of energy drinks.

Key words: Energy drinks, Caffeine, Alcohol, Side effects, Students.

1. Introduction

Energy drinks have become very popular among teenagers, students, and people whose physical activities require quick recovery from strenuous activities, with an additional source of energy [1]. In an aggressive advertising campaign, energy drinks are presented as drinks that increase energy, concentration, alertness, athletic performance, and reduce stress. However, the primary problem is that the mentioned characteristics are extremely variable and depend on the amount of energy drink consumed [2]. Although the name itself leads to the conclusion that it is a drink that contains energy-rich substances that are a source of energy for the body, it is an increased amount of sugar, as a source of energy, while caffeine is an active ingredient that has a stimulating effect. In addition to caffeine, they also contain other metabolic stimulants such as taurine, L-carnitine, creatine, glucuronolactone, vitamins from the B complex group, preservatives, emulsifiers, and may contain other additives such as minerals and plant extracts, apart from guarana, such as yerba mate, acai, ginseng, and ginkgo biloba [3, 4].

Some research supports the occasional health benefit of energy drinks, namely improving mental and physical endurance in both adults and adolescents. Due to its similar structure to adenosine, caffeine can inhibit sleep by binding to adenosine receptors, thereby improving alertness. Research has also proven the effect of energy drinks on improving physical activity in young people and athletes. Consumption of energy drinks improves muscle endurance and strength [5]. However, in addition to the mentioned positive effects, energy drinks can also have many negative effects. The main reason for the appearance of negative effects of energy drinks is caffeine intoxication, which is manifested by: restlessness, nervousness, excitement,

insomnia, gastrointestinal disorders, muscle twitches, perseveration, cardiac arrhythmias, and psychomotor agitation. In cases of overdose, hypertension, hypotension, arrhythmia, and seizures appear, which can lead to death [6]. The problem with energy drink consumption in adolescents and the occurrence of side effects is caffeine intolerance, compared to some adults who have consumed caffeine for years. As a result of reduced tolerance, they are at greater risk of caffeine intoxication due to the absence of caffeine tolerance.

Until now, no research has been conducted in Bosnia and Herzegovina on the awareness and frequency of consumption of energy drinks among the student population, and the main goal of the paper is to show the frequency of consumption and awareness of students about energy drinks.

2. Materials and Methods

The research was conducted as a cross-sectional study in the period from 1 to 15 October 2022. Students of

the Prijedor University Medical School, both sexes, aged between 20 and 25, participated in the research. Before the start of the research, the respondents signed an informed consent to participate in the study. For this research, a questionnaire containing 36 questions related to socio-demographic characteristics, habits in consuming energy and other drinks, and questions related to students' awareness of energy drinks was created. Statistical data analysis was performed with the help of the SPSS statistical software package, version 26. The χ^2 -square test was used as the statistical test. As the level of statistical significance of differences, the usual value $p < 0.05$ was taken. The results are tabulated.

3. Results and Discussion

The study included 65 subjects with an average age of 22 years. Table 1 shows the body mass index concerning the sex of the respondents, as well as the habits of the respondents regarding the consumption of non-carbonated juices, carbonated juices, and alcohol.

Table 1. Characteristics and habits of respondents concerning gender

Characteristics	Parameters	Gender			χ^2	p
		Males N (%)	Females N (%)	In total		
Body mass index	Malnutrition	0 (0)	1 (1.5)	1 (1.5)	2.483	0.478
	Normal body weight	6 (9.2)	43 (66.2)	49 (75.4)		
	Excessive body mass	2 (3.1)	11 (16.9)	13 (20.0)		
	Obesity	1 (1.5)	1 (1.5)	2 (3.1)		
Are you a smoker?	Yes	4 (6.2)	16 (24.6)	20 (30.8)	0.917	0.338
	No	5 (7.7)	40 (61.5)	45 (69.2)		
Average consumption of still juices	< 500 mL	9 (13.8)	50 (76.9)	59 (90.8)	1.062	0.588
	500 - 1000 mL	0 (0.0)	4 (6.2)	4 (6.2)		
	> 1,000 mL	0 (0.0)	2 (3.1)	2 (3.1)		
Average consumption of carbonated juices	< 500 mL	7 (10.8)	55 (84.6)	62 (95.4)	8.753	0.013
	500 - 1,000 mL	1 (1.5)	1 (1.5)	2 (3.1)		
	> 1,000 mL	1 (1.5)	0 (0.0)	1 (1.5)		
Average alcohol consumption	< 100 mL	7 (10.8)	51 (78.5)	58 (89.2)	6.416	0.040
	100 - 500 mL	1 (1.5)	5 (7.7)	6 (9.2)		
	> 500 mL	1 (1.5)	0 (0.0)	1 (1.5)		

The majority of respondents (75.4%) have a normal body mass, do not consume cigarettes (69.2%), on average consume less than 500 mL of non-carbonated juices (90.8%), 95.4% of them consume less than 500 mL of carbonated juices, and the majority respondents (89.2%) consume less than 100 mL of alcoholic beverages on average.

Table 2 shows the distribution of respondents by gender concerning the frequency of consumption of energy drinks.

The largest percentage of respondents (75.4%) states that they sometimes consume energy drinks. A statistically significant difference was observed between the respondents $\chi^2 = 13.256$; $p = 0.019$. Our research is positively correlated with the research conducted in Croatia in 2019 on a sample of 350 respondents, where the majority of respondents stated that they sometimes consume energy drinks [7], as well as in the research conducted among the student population in Serbia, in 2021, in which 62.9% of respondents indicated that they sometimes consume energy drinks [8].

The surveyed population consumes an average of 0.25 L of energy drinks (78.5%) (Table 3).

No statistically significant difference was observed between respondents of different genders $\chi^2 = 2.457$; $p = 0.293$. Research conducted among the student population in the United States of America (2019), Puerto Rico (2016), and Saudi Arabia (2019) indicates a more frequent consumption of energy drinks by men [9, 10, and 11]. The listed research had a significantly bigger number of respondents, which can be the basic reason for the difference in the obtained results in the framework of our research.

A worrying fact is that almost a third of respondents (32.3%) state that they have felt the side effects of energy drinks, which is shown in Table 4.

Similar data were obtained in a survey in Croatia in 2022, where 21.7% of adolescents stated that they felt the side effects of energy drinks [12], as well as in Serbia in 2019 among students of the Faculty of Medicine, where it was determined that 25.2% of students consume energy drinks together with alcohol [13].

Table 2. Frequency consumption of energy drinks in the relationship to gender

Gender	How often do you drink energy drinks?						χ^2	p
	Sometimes	2 - 3 times a month	1 - 2 times a week	3 - 4 times a week	5 - 6 times a week	Every day		
Males N (%)	6 (9.2)	0 (0.0)	1 (1.5)	0 (0.0)	0 (0.0)	2 (3.1)	13.526	0.019
Females N (%)	43 (66.2)	4 (6.2)	7 (10.8)	1 (1.5)	1 (1.5)	0 (0.0)		
Total N (%)	49 (75.4)	4 (6.2)	8 (12.3)	1 (1.5)	1 (1.5)	2 (3.1)	65 (100)	

Table 3. Average quantity of energy drinks in relation to gender

Gender	Average quantity energetic beverage			χ^2	p
	0.25 L N (%)	0.5 L N (%)	> 0.5 L N (%)		
Males	6 (9.2)	2 (3.1)	1 (1.5)	2.457	0.293
Females	45 (69.2)	10 (15.4)	1 (1.5)		
Total N (%)	51 (78.5)	12 (18.5)	2 (3.1)	65 (100)	

Table 4. Occurrence of side effects of energy drinks in the relationship to the average consumption

The average quantity of energetic beverage	Have you ever felt the side effects of energy drinks?			χ^2	p
	Yes	No	I do not know		
0.25 L N (%)	15 (23.1)	35 (53.8)	1 (1.5)	2.587	0.629
0.5 L N (%)	5 (7.7)	6 (9.2)	1 (1.5)		
>0.5 L N (%)	1 (1.5)	1 (1.5)	0 (0.0)		
Total N (%)	21 (32.3)	42 (64.6)	2 (3.1)	65 (100)	

Table 5. Frequency of mixing energy drinks with alcohol concerning the year of study

Year of study	I occasionally consume energy drinks with alcohol		χ^2	p
	Yes	No		
1st year of study N (%)	3 (4.6)	7 (10.8)	2.492	0.477
2nd year of study N (%)	4 (6.2)	12 (18.5)		
3rd year of study N (%)	3 (4.6)	15 (23.1)		
4th year of study N (%)	2 (3.1)	19 (29.2)		
Total N (%)	12 (18.5)	53 (81.5)	65 (100)	

Table 6. Students' awareness of energy drinks

Finding	Yes N (%)	No N (%)	I do not know N (%)
Energy drinks provide energy	32 (49.2)	24 (36.9)	9 (13.8)
Energy drinks contain large amounts of caffeine	53 (81.5)	2 (3.1)	10 (15.4)
A drink that helps maintain alertness	39 (60.0)	19 (29.2)	7 (10.8)
They improve physical endurance	14 (21.5)	38 (58.5)	13 (20.0)
They are used mixed with alcohol	34 (52.3)	22 (33.8)	9 (13.8)
They are effective for increasing physical fitness	4 (6.2)	50 (76.9)	11 (16.9)
They are effective in improving mental ability	1 (1.5)	55 (84.6)	9 (13.8)
They increase concentration	11 (16.9)	43 (66.2)	11 (16.9)
They work to increase body mass	22 (33.8)	26 (40.0)	17 (26.2)
They speed up the work of the heart	59 (90.8)	1 (1.5)	5 (7.7)
It's a sports drink	2 (3.1)	54 (83.1)	9 (13.8)
It is harmful to health	60 (92.3)	1 (1.5)	4 (6.2)
Increases blood pressure	47 (72.3)	2 (3.1)	16 (24.6)
Contains large amounts of sugar	59 (90.8)	6 (9.2)	0 (0.0)
It has no effect on people	9 (13.8)	42 (64.6)	14 (21.5)

In recent years, there has been a trend around the world of young people mixing energy drinks with alcohol. Concerning the year of study and consumption of energy drinks with alcohol, no statistically significant difference was observed among the respondents (Table 5).

A smaller percentage of respondents (18.5%) state that they occasionally consume energy drinks with alcohol. Research conducted in the Netherlands in 2014 determined the consumption of energy drinks with alcohol in 39.1% of male and 60.9% of female respondents [14].

Table 6 presents the students' awareness of energy drinks with descriptive statistics. Most respondents are familiar with the effects and impact of energy drinks on health.

4. Conclusions

- In the student population, the side effects of energy drinks can cause serious health problems compared to

the potential benefits that the consumption of energy drinks brings.

- This research shows that, as in most other countries, there is a trend of frequent use of energy drinks among the student population. With more frequent consumption, the risk of side effects is greater.

- In our research, a third of respondents stated that they felt unwanted effects, and the majority of respondents were familiar with the ingredients and effects of energy drinks. Vulnerable groups should be influenced by education and legal regulations, to reduce the frequency of use of energy drinks.

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