

The Effect of Energy Drinks on the Cardiovascular System in Students

Zokirova G. D., Khodjanova Sh. I.

Tashkent medical academy, Tashkent, Uzbekistan

Article Information

Received: December 25, 2022

Accepted: January 26, 2023

Published: February 27, 2023

Keywords: *energy drinks, cardiovascular system, students*

ABSTRACT

The use of energy drinks among students is growing every year. It becomes impossible to study, work, take sessions and even relax without drinking energy drinks. In this article we will focus on the effect of energy drinks on the cardiovascular system of students, the composition of drinks and the attitude of students to them.

Purpose: to find out the popularity of energy drinks among students and to determine their impact on the cardiovascular system.

Research methods: to determine the level of popularity of energy drinks, a survey was conducted (the author created an online questionnaire). 60 students (3rd-4th year) took part in the survey. The blood pressure (BP) was measured and the heart rate (HR) was calculated in students. The age range was 20-25 years. **As a result** of the survey, it was determined that more than half of the students use EN and most of them use energy drinks because of their taste and do not notice a surge of vigor and strength and are ready to completely abandon them. And also 1/4 of the students after taking EN noted periods of palpitations and pain in the heart, dizziness. The results of determining the heart rate in the same patients showed 81%- normocardia, 19%-tachycardia in those and 57%-normocardia, 36%- tachycardia, 5%-bradycardia, 2%-arrhythmia, respectively. To the question whether they will be able to completely abandon EN, 8.8% - for a negative answer, 8.8%-find it difficult to answer and 82.5%- are ready to completely abandon energy drinks. The majority of students who consume energy drinks had blood pressure within normal parameters. It is noteworthy that the heart rate violation in the form of tachycardia occurs due to excessive and prolonged intake of energy drinks.

Conclusion: It should be noted that a large number of serious complications from EN are due to excessive consumption of products or their use for a short period of time. Therefore, it is important for companies producing EN to place a warning on their drinks. The exact amounts and concentrations that are ideal for minimizing health risks are largely unknown. Based on this, the best option is to give up energy drinks. Use healthy habits, adjust the daily routine and exercise more.

Introduction.

The rhythm of our life is getting faster and faster every year. it would not be bad to add an extra hour, and preferably several a day, in order to have time for everything planned. Sleep and rest are relegated to the background, but sooner or later our strength leaves us, and then many students resort to drinking energy drinks.

Energy drinks (EN), which promise to increase athletic performance, increase concentration and attention, have become very popular in the last few years. The increased stress associated with academic, sports and social achievements is the reason that the majority of EN consumers are

teenagers and students. In recent years, energy drinks have been treated with caution as potentially dangerous due to their high content of caffeine and substances such as taurine, guarana and L-carnitine [1, 3, 5, 7]. In addition, cases of poisoning from EN are registered annually all over the world, including symptoms such as tachycardia, arrhythmia, ACS and eventually death from drinking energy drinks. The use of energy drinks among students is growing every year. It becomes impossible to study, work, take sessions and even relax without drinking energy drinks. In this article we will focus on the effect of energy drinks on the cardiovascular system of students, the composition of drinks and the attitude of students to them [2,4,6,8].

An energy drink (EN) is a medium carbonated or highly carbonated non-alcoholic or low-alcohol drink that contains substances that create the effect of a surge of vivacity and strength. The first drink was released in Japan in 1960.

According to studies conducted in European countries, the main consumers of energy drinks are teenagers:

- ✓ children (under 10 years old) – 18%;
- ✓ teenagers (from 10 to 18 years old) – 68%;
- ✓ adults (over 18 years old) – 30%.

The law prohibiting the sale of energy drinks to persons under the age of 18 and imposing restrictions on their advertising was adopted at the 17th plenary session of the Senate of the Oliy Majlis of Uzbekistan. The document contains amendments and additions to legislative acts aimed at improving public order. 2017 October 17. The law includes a definition of the concept of "energy drink". This is a drink containing more than 150 milligrams per liter of caffeine and / or other components that have a sufficient effect on changing the tone of the human body [9,11,13,15].

After drinking energy drinks, the body stimulates and increases the activity of the nervous, cardiovascular, digestive, endocrine and urinary systems. The body begins to work with a greater load, this leads to the fact that it experiences additional stress and there is an increase in the blood level of adrenaline.

As a result, there are symptoms such as increased anxiety and tension, trembling in the extremities, increased pulse, increased blood pressure, increased blood glucose levels and frequent urge to urinate. Side effects include sleep disorders and insomnia, cardiac arrhythmias - various arrhythmias, pain in the heart, ACS, nausea, vomiting, abdominal pain, obesity, muscle cramps and erosion of tooth enamel [10,12,14,16].

Purpose: to find out the popularity of energy drinks among students and to determine their impact on the cardiovascular system

Tasks:

1. Conduct a survey among students in order to study their attitude to energy drinks and analyze the results.
2. Analyze the composition of some energy drinks
3. To investigate the effect of energy drinks on the cardiovascular system in students

Research methods: to determine the level of popularity of energy drinks, a survey was conducted (the author created an online questionnaire). 60 students (3rd-4th year) took part in the survey. The blood pressure (BP) was measured and the heart rate (HR) was calculated in

students. The age range was 20-25 years.

Results. According to the survey results:

1. Have tried energy drinks -58%, 42% respectively have not tried.
2. 74% tried EN for the first time more than a year ago, 13% -a year ago, 12% - from 3 to 6 months ago, 1% - no more than a month ago.
- 3.74%- students do not buy EN often, 12%-several times a month, 4%-several times a week, 5%-several times a month, 5% - every day.
4. Buy in the amount of 1 jar – 94%, 4% - two jars, several jars – 2%.

The composition of popular drinks includes:

	Burn	XXL	Red Bull	Adrenaline Rush	Bullit
Energy value, kCal	61,3	47,3	45	52	48
Carbohydrates, g	14,3	11,2	11,3	13	11
Taurine, mg	420	400	400	399	240
Caffeine, mg	35	32	32	30	30
Ascorbic acid (C), mg				36,1	
Nicotinic acid (B3), mg	0,58	4,4	8		7,2
Pantothenic acid (B5), mg	0,11	2	2		2
Pyridoxine (B6), mg	0,06	0,2	2	0,8	0,8
Folic acid (B9), mcg	0,028	0,02	0,02	0,04	0,0004
Inositol (B8), mg	12			21,7	
Guarana extract, mg	5,3			+	
L-carnitine, mg				100	
D-ribose, mg				201	
Ginseng extract, mg				4,8	

The cardiovascular effects of caffeine have been thoroughly studied. The inotropic effect of caffeine on the heart muscle has long been viewed with suspicion as a possible cause of heart disease in some people. Over the past couple of decades, coffee has been associated with various harmful effects, such as hypertension, stomach ulcers, palpitations, anxiety, trembling and, eventually, heart disease. Therefore, caffeine plays an important role in understanding the possible dangers of EN.

In healthy people, caffeine, methylxanthine, increases the activity of the sympathetic nervous system. The molecular mechanism of caffeine is its competitive inhibition of phosphodiesterase. A single administration of caffeine can increase the level of catecholamines, blood pressure, renin and free fatty acids. There is evidence indicating possible side effects of caffeine, especially when consumed in high doses. Toxic doses can affect the conduction and refractoriness of the heart, which leads to the development of various arrhythmias

Caffeine is mainly metabolized by the cytochrome P450 1A2 (CYP1A2) enzyme of the liver, and defects of such an enzyme are associated with population differences in metabolism and half-life. Consequently, genetic polymorphisms of the CYP1A2 pathway may explain some inconsistencies in studies of coffee and its effects on health [17,19].

There is a widespread opinion that caffeine can be arrhythmogenic in those who regularly consume it. However, a large-scale Danish study did not reveal a higher risk of atrial fibrillation/flutter with different amounts of caffeine consumed. In addition, the stimulating

effects of caffeine seem to vary from person to person, in fact, the degree of tolerance and dependence on it is probably inherited and may be associated with polymorphism

Taurine is a derivative of the amino acid cysteine and is found in large quantities in the heart and skeletal muscles [18,20]. It is added in large quantities to energy drinks. Taurine deficiency is associated with a decrease in the sensitivity of the heart muscle to Ca and, consequently, a decrease in the inotropic ability of the organ. This may be the reason that supplements allegedly increase physical performance by improving blood supply to other organs, in particular the musculoskeletal system. It is worth noting that clinical studies evaluating the effects of taurine are limited.

The B vitamin complex includes eight vitamins that act as coenzymes for the proper functioning of cells, especially mitochondrial function and energy production. Energy drinks often contain large amounts of B vitamins, and in larger doses than the recommended daily dose for healthy people.

Paulliniacupana or guarana, is a South American plant that was mentioned in 1872 and was used by the inhabitants of the Amazon to increase strength and energy. The stimulating effect of guarana is due to its chemical composition, similar to caffeine. Guarana seeds contain from 2% to 4.5% caffeine, compared to 1%-2% in coffee beans. The guarana effect is not yet known. It is not clear whether it has an additive or synergistic effect in combination with caffeine.

The survey results showed:

1. Often feel periods of palpitation – 12%, rarely - 31%, and 57% of students do not notice.
2. There are pains in the heart area – 53% do not, sometimes 47% and often 5% of students do.
3. Headaches after drinking energy drinks are often felt by 9%, sometimes 7% and do not feel 84%.
4. 6% are often disturbed by dizziness, sometimes 31% and 63% do not notice
5. 60% notice problems with sleep, respectively, 40% do not notice problems with sleep.
6. When asked if energy drinks help you stay awake, 36% gave a positive answer, 33% gave a negative answer and 31% found it difficult to answer.
7. So why do you drink them answered as follows - because of their taste - 32%, almost do not drink-30% to cheer up - 21%, just wondering-17%

Based on the periods of use of EN, we divided the students into those who drink EN for more than a year, and those whose duration of use does not exceed a year. And their HELL was measured. In students who drink EN for a long time, the average systolic and average diastolic blood pressure was 130 mmHg and 75 mmHg, respectively. Students who use EN for less than a year have an average systolic 120 mmHg and an average diastolic 70 mmHg.

The results of determining the heart rate in the same patients showed 81%- normocardia, 19%-tachycardia in those and 57%-normocardia, 36%- tachycardia, 5%-bradycardia, 2%-arrhythmia, respectively

To the question whether they will be able to completely abandon EN, 8.8% - for a negative answer, 8.8%-find it difficult to answer and 82.5%- are ready to completely abandon energy drinks.

The Munich group studied the effect of the use of caffeinated EN on the stiffness of the arterial walls of healthy adolescents. Stiffness was assessed sonographically by two-dimensional speckle tracking of the common carotid artery (CCA) at the beginning of the study and within 4 hours after drinking the drink. It turned out that after taking EN, there is a significant decrease in the

peak circumferential deformation of the WASP. This means that the stiffness of the vascular wall increases.

Another randomized placebo-controlled cross-sectional study of 26 adolescents showed that their use of EN led to a decrease in heart rate and a significant increase in the number of supraventricular extrasystoles compared with placebo.

During the study, a literature review was conducted and it was found that people consuming any type of energy drink had a QT interval of 6 milliseconds or 7.7 milliseconds higher for 4 hours compared to those who drank a placebo.

Despite the frankly small sample of studies, all of them clearly demonstrate the negative impact of EN on the CCC of adolescents. This is especially important for children with diseases such as hypertension, diabetes, overweight or congenital heart defects. Undoubtedly, studies with a much larger sample are needed, as well as an analysis of the long-term consequences of using EN.

Conclusion:

As a result of the survey, it was determined that more than half of the students use EN and most of them use energy drinks because of their taste and do not notice a surge of vigor and strength and are ready to completely abandon them. And also 1/4 of the students after taking EN noted periods of palpitations and pain in the heart, dizziness. Almost half of the surveyed students have disturbed sleep.

The majority of students who consume energy drinks had blood pressure within normal parameters. It is noteworthy that the heart rate violation in the form of tachycardia occurs due to excessive and prolonged intake of energy drinks.

It should be noted that a large number of serious complications from EN are due to excessive consumption of products or their use for a short period of time. Therefore, it is important for companies producing EN to place a warning on their drinks. The exact amounts and concentrations that are ideal for minimizing health risks are largely unknown.

With the exception of the effects of caffeine, the ingredients of EN have not been thoroughly studied to confirm their safety for the cardiovascular system or the proclaimed benefits of increasing energy.

Based on this, the best option is to give up energy drinks. Use healthy habits, adjust the daily routine and exercise more.

References:

1. Frost L, Vestergaard P. Caffeine and risk of atrial fibrillation or flutter: the Danish Diet, Cancer, and Health Study. *Am J Clin Nutr.* 2005;81:578-582.
2. Malinauskas B.M., Eby V.G., Overton R.F., Carpenter-Eby T., Barber-Heydal K. A study of energy drink consumption patterns among college students. *Nutr J.* 2007; 6:35 .
3. Kotter B.V., Jackson D.A., Merchant R.S., Babu K.M., Baird J.R., Nirenberg T., Linakis J.G. Energy drinks and the use of other psychoactive substances by adolescents and young patients of emergency departments. *Pediatr Emerg Care.* 2013; 29 :1091–1097.
4. Lin CI, Vassalle M. The role of calcium in the inotropic effects of caffeine in Purkinje cardiac fibers. *Int J Cardiol.* 1983; 3 : 421-434. 5. Shapiro R.E. Caffeine and headaches. *Neurobiology* 2007; 28 Appendix 2 : S179–S183.
5. Sepkovits K.A. Energy drinks and caffeine-related side effects. *JAMA.* 2013; 309 : 243–244.

6. Mesas A.E., Leon-Munoz L.M., Rodriguez-Artalejo F., Lopez-Garcia E. The effect of coffee on blood pressure and cardiovascular diseases in hypertensive patients: a systematic review and meta-analysis. *Am J Clin Nutr.* 2011; 94 : 1113-1126.
7. Zulli A, Smith RM, Kubatka P, Novak J, Uehara Y, Loftus H, Qaradakh T, Pohanka M, Kobyliak N, Zagatina A, et al. Caffeine and cardiovascular diseases: a critical review of current research. *Heb J Nutr.* 2016; 55:1331-1343.
8. Зокирова, Г. Д., Ходжанова, Ш. И., & Кодирова, Ш. А. (2023). ВЛИЯНИЕ ЭНЕРГЕТИЧЕСКИХ НАПИТКОВ НА СЕРДЕЧНО-СОСУДИСТУЮ СИСТЕМУ У СТУДЕНТОВ. *Theoretical aspects in the formation of pedagogical sciences*, 2(4), 121-122.
9. Alyavi, A. L., Khojanova, S. I., Reymbaeva, A. A., Jabbarov, A. A., Makhsudova, M. X., Saydaliyev, R. S., ... & Tursunova, L. D. (2023). FEATURES OF THE COURSE OF THE DISEASE IN PATIENCE WITH CHRONIC HEART FAILURE RESISTANT TO ADP-INDUCED PLATELET AGGREGATION. *Академические исследования в современной науке*, 2(3), 114-116.
10. Jabbarov, O. O., Tursunova, L. D., Tashpulatova, M. X., Daminov, B. T., Boboev, K. T., & Maksudova, L. I. (2020). Associations of polymorphic markers aluins/deli> D Ace T-786C gene Enos3 in diabetic nephropate progressing for type 2 diabetes mellitus. *International Journal of Research in Pharmaceutical Sciences*, 11(4), 6028-6032.
11. Реймбаева, А. А., Аляви, А. Л., Ходжанова, Ш. И., Жаббаров, А. А., Сайдалиев, Р. С., Кодирова, Ш. А., & Максудова, М. Х. (2023). Особенности Течения Хронической Сердечной Недостаточности, Резистентной К Антиагрегантной Терапии. *Central Asian Journal of Medical and Natural Science*, 4(1), 153-159.
12. Султонов, П. И., Умарова, З. Ф., Жаббаров, О. О., Ходжанова, Ш. И., Кодирова, Ш. А., Жуманазаров, С. Б., & Рахматов, А. М. (2023). Антиагрегант Терапияни Сурункали Буйрак Касаллигида Буйрак Функционал Захирасига Таъсири.
13. Umarova, Z. F., Tursunova, L. D., Maksudova, M. X., Hodjanova, S. I., Mirzayeva, G. P., & Nadirova, Y. I. (2023). *DIASTOLIC DYSFUNCTION IN PATIENTS WITH CORONARY ARTERY DISEASE LATE AFTER CORONARY STENTING* (Doctoral dissertation).
14. Сайдалиев, Р. С., Ходжанова, Ш. И., Жуманазаров, С. Б., & Мирзаева, Г. Ф. (2023). Дополнительный Прием Предутала Mg У Пациентов С Острой И Хронической Сердечной Недостаточности. *Central Asian Journal of Medical and Natural Science*, 4(1), 64-67.
15. Frost L., Westergaard P. Caffeine and the risk of atrial fibrillation or flutter: a Danish study of diet, cancer and health. *Am J Clin Nutr.* 2005; 81 : 578-582.
16. Temple J.L. Caffeine consumption by children: what we know, what we have yet to learn and why we should worry. *NeurosciBiobehav Rev.* 2009; 33 : 793-806.
17. Aklillu E, Djordjevic N, Carrillo JA, Makonnen E, Bertilsson L, Ingelman-Sundberg M. The high activity of the CYP2A6 enzyme, measured using a caffeine test, and the unique distribution of variant CYP2A6 alleles in the Ethiopian population. *OMICS.* 2014; 18 :446-453.
18. Williams M.H. Dietary supplements and sports results: introduction and vitamins. *Journal of the International Society of Sports Nutrition.* 2004; 1 :1.