British Journal of Global Ecology and Sustainable Development
Volume-28, May - 2024
ISSN (E): 2754-9291

EFFECT OF ENERGY DRINKS ON LIVER FUNCTIONAL INDICATORS

[1]Tokhtayeva N. X.
[2] Bolkiyev S. A.
[3] Eshbekova L.SH.
[4] Hamdamov A. I.
[5] Nazirov N. R.

1. Associate Professor of the Department of Internal Medicine, TTA No. 2, tfd nigora321@mail.com , +998901281831
2. Student of the medical faculty of TTA, samandar.balqiyev@gmail.com , +998941910107
3. Student of the medical faculty of TTA, eshbekovalobar14@gmail.com , +998883250819
4. Student of the medical faculty of TTA, hamdamovahror07@gmail.com , +998945274642
5. Student of the medical faculty of TTA, dr_muhammad98@mail.ru +998978137813

Abstract
Energy drinks are one of the most popular soft drinks in the world. As a result of various pathological processes caused by energy drinks, various diseases occur in several organs, including the heart. Many caffeinated energy drinks can cause liver damage if consumed in excess. Energy drinks contain many additives such as caffeine, taurine, B vitamins and other ingredients (Box 1). Niacin (vitamin B3) has been shown to cause hepatotoxicity, ranging from mild elevations of blood aminotransferases to liver failure (8).

Keywords: Energy drink, ALT, AST, GGT, guarana, group B vitamins, cerebral hemorrhage, acute renal failure, rhabdomyolysis, metabolic acidosis, hyperinsulinemia

Cost:
The demand for energy drinks is increasing worldwide. Up to 70% of the world's youth now consume energy drinks. Energy drinks contain large amounts of caffeine and several other psychoactive substances, including the amino acid taurine, B vitamins, the glucose derivative glucuronolactone, and ginseng and guarana (another source of caffeine, caffeine with) are soft drinks containing plant extracts [1]. It was first produced in the 1960s in Japanese hospitals as a power medicine, and later enriched with various psychoactive substances. Marketed in Europe and Asia, they have spread throughout the world since the end of the last century [2]. The short- and long-term health effects of energy drink consumption on the cardiovascular and central nervous systems have been intensively studied. Energy drinks also have an effect on liver and kidney functions for which there is no clear cause [4]. Energy drinks have been associated with a number of adverse effects in humans, especially in young people, including high blood pressure,

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serious cardiovascular events (arrhythmia, myocardial infarction), kidney disease, metabolic adverse effects: poor sleep, insomnia, and neuropsychiatric adverse effects. has been shown to cause adverse effects [3]. In healthy subjects, systolic heart pressure (6 to 10 mm Hg), as well as diastolic heart pressure (3 to 6 mm Hg) and increased heart rate (3 to 6 mm Hg) was observed. 3 to 7 times), atrial fibrillation has been reported in healthy people after consuming an energy drink. With the consumption of several energy drinks in a short period of time, researchers noted ventricular arrhythmia [9]. Coronary artery bleeding occurs in healthy adults who consume 2 to 8 energy drinks. Researchers have found a relationship between excessive consumption of energy drinks and epileptic seizures, reversible cerebrovascular constriction, cerebral hemorrhage, acute renal failure, rhabdomyolysis, metabolic acidosis, hyperinsulinemia [10]. In addition, regular consumption of energy drinks affects liver function, including liver cirrhosis and liver failure [11].

The purpose of the study: to study the effect of consumption of energy drinks on liver functions in adults.

Materials and Methods: The study was a cross-sectional analytical study aimed at evaluating the effect of energy drink consumption on liver function tests. 60 students of the Tashkent Medical Academy, especially those who regularly consumed energy drinks, were involved. The study population was divided into three groups: those who do not take energy drinks (10 participants), those who regularly consume up to 6-7 drinks per week (30 participants), and those who consume 2-4 drinks per week (20 participants). Sampling and Methods A 5 mL venous blood sample was collected from each participant under antiseptic conditions from a wrist vein. Samples were collected in dry serum tubes and allowed to clot for 10-15 minutes before being centrifuged at 1000 × g for 5 minutes and stored for liver function tests (ALT, AST, GGT). It was analyzed using automated Humastar 200 and semi-automated Microlab 300 devices in the biochemistry laboratory of the private clinic "Shox International Hospital". Tests were evaluated using colorimetric and kinetic methods with human reagent kits.

Exclusion criteria: Participants who consumed 3 low-energy drinks per week, pregnant women, individuals with high blood pressure, and patients with hepatitis B or C.

Statistical analyses: Bonferrei post-hoc paired comparisons were used to assess differences between groups using Windows SPSS version 20.0. $P<0.05$ was considered statistically significant.

Result: The study included 60 participants between the ages of 20 and 25, with a mean of 20.98 and a standard deviation of 2.6. Blood samples were taken from 10 participants who did not consume energy drinks and 50 energy drink users as a control group. When

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comparing the average liver function test results between the control group and energy drink consumers, it was found that there was no significant difference in ALT and GGT levels. However, there was a significant difference in AST levels, with an increase observed in energy drink consumers. When energy drink consumers were divided into three groups based on the frequency of energy drink consumption, the following was observed:

Analysis of liver function showed that only AST was significantly increased ($P < 0.05$) in groups 1 compared to the control group (25.75 ± 3.98, respectively). There was no significance in ALT levels in all groups (13.35±1.65, and 12.4±2.5, respectively) and GGT levels in all groups (15.21±2.25, and 15±4.92).

AST U/ml	Control group Group 1 Group2	17.70±1.65 25.75 ± 3.98 17 ± 2.1	 P<0.05 NS
ALT U/ml	Control group Group 1 Group2	12.7±1.65 12.35 ± 1.65 12.4 ± 2.5	 NS NS
GGT U/ml	Control group Group 1 Group2	15.79±1.09 15.21±2.25 15±4.92	 NS NS

Control group: control group that did not consume energy drink (10 participants), group 1: group that consumed 6-7 per week (30 participants); Group 2: group consuming 2-4 per week (20 participants); . Compared with the AST: aspartate transaminase, ALT: alanine transaminase, GGT: gamma-glutamyl transferase group, the levels in group 2 did not change compared to the control group, and no significant relationships were observed. It was found that the level of AST increased in groups 1 compared to the control group. A significant relationship was observed in ALT 1 groups. GGT levels were found to decrease between groups 1 and 2 compared to the control group.

Debate

The results of our study showed that there was no relationship between energy drink consumption and ALT ($P < 0.05$), but all consumers had lower ALT values. This is consistent with another study that found lower ALT (Ebuehi 2011) in rats given energy drinks compared to a control group [14]. However, another study showed generally higher ALT levels ($P < 0.05$) in experimental rats than in the control group (Ugwuja 2014). Our study showed a significant increase in AST levels with energy drink consumption ($P < 0.05$), which is consistent with another study that showed higher AST levels in rats with high doses of energy drinks and alcohol [15]. In contrast, another study found lower AST in rats given energy drinks. The results of our study showed that there was no correlation between energy drink consumption and gamma glutamyl transferase (GGT) levels. However, other studies have shown that excessive consumption of energy supplements can lead to elevated GGT levels. Several factors can

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contribute to this increase, including the use of certain medications, alcohol consumption, and long-term consumption of high-energy supplements. Factors such as these can affect gamma glutamyl transferase (GGT) test results, for example, phenytoin and drugs can cause a negative result [16].

Summary

A healthy person can develop acute liver failure after an episode of excessive energy drink consumption. Thus, all substances used in patients with acute liver injury of unknown etiology, both legal and illegal, should be part of the initial workup. More research on energy drinks and their ingredients is needed to better understand the health effects of these drinks.

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