IRASS Journal of Multidisciplinary Studies
https://irasspublisher.com/journal-details/IRASSJMS
ISSN *(Online) 3049-0073*

Study of the relationship between Body Mass Index (BMI), liver enzymes, and kidney function, and its association with energy drink consumption

Nashwan Majeed Ali Al-Gburi*

DNA Research Center, University of Babylon, Hillah-Najaf Street, Babylon state, 51001, Iraq

Corresponding Author: Nashwan Majeed Ali Al-Gburi

DNA Research Center, University of Babylon, Hillah-Najaf Street, Babylon state, 51001, Iraq

Article History

Received: 19 / 06 / 2026

Accepted: 28 / 07 / 2026

Published: 17 / 08 /2026

Abstract: The widespread consumption of energy drinks has become common among different segments of society, especially among young people, due to their association with increased overall physical activity. The general effect of these drinks is attributed to their content of active ingredients such as caffeine, various sugars, taurine, as well as some herbal extracts.

This study aimed to evaluate the potential effects of energy drinks on liver enzymes and kidney function. The study was conducted on 30 volunteers (24 males and 6 females). Information about the participants was collected using a specially designed questionnaire to determine whether they had any previous disorders affecting liver or kidney function, Blood samples were collected from each participant two hours after consuming energy drinks. The samples were transported in cooled containers to the Physiology Laboratory for serum separation and analysis. The obtained results were statistically analyzed using SPSS software, and mean comparisons were performed using the T-test, The results showed that most measured parameters were not significantly affected by the consumption of energy drinks, except for urea levels, which were significantly elevated.

Conclusion: The findings suggest that the effects of energy drinks on liver and kidney cells and functions may be cumulative. This indicates that excessive and acute consumption of these beverages may have a negative impact on liver and kidney enzyme activity.

Keywords: *Energy drinks; Caffeine; Liver enzymes; Kidney function; Renal function; Hepatic function; Serum urea; Blood biochemical parameters; Taurine; Acute consumption; Liver function; Kidney biomarkers; Young adults..*

How to Cite in APA format: Al-Gburi, N. M. A. (2026). Study of the relationship between Body Mass Index (BMI), liver enzymes, and kidney function, and its association with energy drink consumption. *IRASS Journal of Multidisciplinary Studies, 3(8), 58-60.* http://doi.org/10.67564/IRASSJMS.v3.i8.0184

Introduction

Energy drinks are defined as commercially available beverages that are sold without a prescription. These drinks contain high levels of caffeine (stimulants) [9, 10], and are marketed as energy-enhancing products that improve mental alertness and physical performance. They are widely available under various brand names in markets, retail stores, and online platforms [1].

Excessive consumption of these beverages has been associated with cases of acute liver damage and elevated levels of liver enzymes, particularly AST and ALT [2]. In severe cases, the degree of toxicity may necessitate liver transplantation and can sometimes result in death. Despite these risks, uncertainty remains regarding these beverages, as the specific components responsible for liver injury have not yet been clearly identified. This is especially notable given that caffeine is also present in other commonly consumed stimulants such as soft drinks and coffee. Furthermore, energy drinks differ in their caffeine concentrations across brands and contain numerous additional ingredients, including flavorings, various sugars, vitamins, minerals, amino acids, as well as plant-based components and extracts, which are believed to potentially contribute to liver and kidney damage [3]. Popular brands such as Tiger, Red Bull, Rockstar, and MIX contain multiple compounds that may interact with one another in terms of their effects and mechanisms of action. Some studies have indicated that caffeine may increase the risk of kidney disease, elevate blood levels of urea and creatinine, and enhance sodium excretion in urine. Other research has suggested a possible association between increased body mass index (BMI) and disturbances in certain biochemical markers, particularly liver enzymes. Indeed, studies have reported a potential link between elevated BMI and metabolic disorders, as well as impaired kidney and liver function. An increased BMI is associated with fat accumulation in the body, particularly visceral fat, including fat deposition in the liver, leading to what is known as non-alcoholic fatty liver disease (NAFLD) [4,5]. This condition contributes to elevated concentrations of liver enzymes in the blood and may also negatively affect glomerular filtration rate and overall kidney function. Consequently, the risks associated with energy drinks may be exacerbated by higher levels of consumption [6]. Given the potential health hazards of these beverages, the present study aims to provide a comprehensive review of their possible effects on the critical functions of the liver and kidneys, The study aims the potential effects of energy drinks on the vital functions of the liver and kidneys.

Materials and Methods

Study Design and Sample Selection

A descriptive cross-sectional study was conducted on a sample of donors. The study included 30 donors (24 males and 6

females) who were randomly selected. The data of each participant were recorded using a specially designed form prepared for this purpose. The mean age of the participants was 22 years. A number of participants were excluded after measuring blood glucose levels and blood pressure[11, 12].

Blood Sample Collection

Blood samples were collected from each participant two hours after consuming an energy drink to investigate the immediate physiological changes in liver enzyme markers and kidney function parameters, in order to evaluate the potential effects. The study was conducted in February 2026.

Approximately 5 mL of venous blood was drawn from each donor two hours after energy drink consumption using disposable medical syringes. The blood samples were placed in gel tubes and centrifuged at 4000 rpm for 5 minutes to separate the serum. The serum was then transferred into plain tubes and stored at −20°C until analysis[13].

Biochemical Analysis

The study included measuring the activity of liver enzymes (ALT, AST, ALP) and kidney function parameters, including urea and creatinine, using an automated biochemical analyzer (full auto) from Mindray (BS-230)[14, 15].

Statistical Analysis

Statistical analysis of the data was performed using the SPSS software package.

Result

Table (1): Distribution of the sample by gender and percentage

Gender	No	Percentage
Male	**24**	**80%**
Female	**6**	**20%**
Total	**30**	**100**

Table (2): Descriptive Statistics of AST (GOT), ALT (GPT), Urea, and Creatinine Levels After Energy Drink Consumption (N = 30)

Parameter	NO	Mean	Std. Deviation
AST (GOT) U/L	30	21.80	3.986
ALT (GPT) U/L	30	18.80	6.810
Urea (mmol/L)	30	25.73	2.778
Creatinine(mg/dL)	30	0.797	0.113

The result show in table (2) that the mean activity of AST was 21.80 U/L and ALT was 18.80 U/L. These values fall within the normal physiological range of these enzymes, indicating that energy drink consumption did not exert an acute hepatocellular effect at the time of intake. This may also suggest that moderate consumption of energy drinks does not result in liver cell damage. This finding is consistent with the results reported in study [40], which indicated that cumulative liver cell injury is primarily associated with excessive and irregular consumption of such beverages, whereas moderate intake has no significant adverse effect.

Regarding urea, the observed elevation above normal levels may be attributed to the transient effect of energy drinks on renal function, suggesting that the impact was temporary rather than persistent. In contrast, creatinine levels remained within the normal range, further supporting the notion that kidney function was not significantly impaired. Since creatinine is a reliable indicator of glomerular filtration, its normal level suggests the absence of any substantial dysfunction in renal filtration, despite the observed increase in urea.

Table (3): One-Sample T-Test Results Comparing Biochemical Parameters After Energy Drink Consumption with Upper Normal Reference Values

Parameter	Normal Value	Mean difference	T-Value	P-Value
AST	45 U/L	23.20	31.878	0.01
ALT	45 U/L	26.20	21.673	0.01
Urea	40(mmol/L)	14.27	28.125	0.01
Creatinine	1.4(mg/dL)	**0**.603	29.269	0.01

Table (3) presents the results of the one-sample t-test. All measured parameters in the present study were within the normal physiological ranges. The presence of statistically significant differences does not necessarily indicate pathological effects;

rather, it reflects that the observed values were significantly lower than the upper reference limits. The negative mean differences further indicate that the values are far below levels associated with potential pathological impact of energy drink consumption.

These findings may be influenced by certain study limitations, including the relatively small sample size and the absence of a control group for direct comparison. In this study, the normal reference values were used as the comparator instead of an independent control group, which may limit the strength of the conclusions [7].

Recent studies have indicated that elevated liver enzyme activity and renal dysfunction are typically associated with excessive and unregulated consumption of energy drinks. However, at moderate or low intake levels, no significant effects on enzyme activity are generally observed. Nevertheless, their cumulative impact in the body may, over time, ultimately lead to adverse health effects[8].

Conclusion

1. No changes in liver enzyme levels were observed two hours after energy drink consumption.
2. The results showed no impairment in creatinine levels, indicating normal glomerular filtration.
3. The observed increase in urea levels may be attributed to the high caffeine content of energy drinks and insufficient water intake.
4. The one-sample t-test demonstrated that all values were below the upper normal reference limits, despite the presence of statistically significant differences, indicating the absence of pathological effects.
5. Overall, the findings suggest that moderate consumption of energy drinks does not lead to significant disturbances in liver and kidney function in healthy individual.

References

1. Dobrek, L. (2025). The review on adverse effects of energy drinks and their potential drug interactions. Nutrients, 17(15), 2435.
2. Jesse, B. D., Nguyen, N. V., & Balasanova, A. A. (2024). Acute Liver Failure and Liver Transplant After Excessive Energy Drink Consumption. The Primary Care Companion for CNS Disorders, 26(1), 51135.
3. El-Din, A. G. N., Eid, R. A., Nasef, H. Y., & Darweesh, A. H. Potential Effects of Caffeine on Hepatotoxic Rats Induced by Carbon Tetrachloride.
4. Gamal Nour El-Din, A., Adel Eid, R., Y Nasef, H., & Hamdy Darweesh, A. (2024). Potential Effects of Caffeine on Hepatotoxic Rats Induced by Carbon Tetrachloride. مجلة الاقتصاد المنزلي, 40(1), 83-102.
5. Dranoff, J. A. (2023). Coffee as chemoprotectant in fatty liver disease: Caffeine-dependent and caffeine-independent effects. American Journal of Physiology-Gastrointestinal and Liver Physiology, 324(6), G419-G421.
6. Dranoff, J. A. (2024). Coffee, adenosine, and the liver. Purinergic signalling, 20(1), 21-28.
7. Jasim, K., Abdullah, B., Hasan, K., Salih, L., & Jasim, J. (2025). Evaluating the Effects of Energy Drink Consumption on Liver Function among Students and Staff at Cihan University, Duhok, Iraq. Journal of Life and Bio Sciences Research, 6(01), 50-54.
8. Elbendary, E. Y., Mahmoud, M. H., Salem, S. F., & Farah, A. M. (2023). The Effects of energy drink consumption on kidney and liver function: A comparative study. Journal of Biosciences and Medicines, 11(03), 171-181.
9. Teijeiro, A., García, G., Guerra-Tort, C., Candal-Pedreira, C., Rey-Brandariz, J., Mourino, N., & Pérez-Ríos, M. (2025). Energy Drinks and Health. In Handbook of Public Health Nutrition: International, National, and Regional Perspectives (pp. 1-28). Cham: Springer Nature Switzerland.
10. Jorgensen, A., Brandslund, I., Ellervik, C., Henriksen, T., Weimann, A., Andersen, M. P., ... & Poulsen, H. E. (2024). Oxidative stress-induced damage to RNA and DNA and mortality in individuals with psychiatric illness. Jama Psychiatry, 81(5), 516-520.
11. Xu, K. Y., Baumgartner, K. T., Shankar, S., Huckenpahler, A., & Glaser, P. E. (2024). Energy Drinks: A Clinical Primer and National Data Update. Missouri Medicine, 121(6), 481.
12. Omer, B. Z., Ali, A. A., Mohammed, R. A., Ali, M. A., Rashed, R. A., & Atwan, O. B. (2025). Prevalence of Metabolic Syndrome among Caffeinated Energy Drinkers (Case-Control Study) (Doctoral dissertation, Cihan University-Erbil).
13. Becerra, L. A., & Mansour, S. G. (2025). Exercise and Kidney Health: Core Curriculum 2026. American Journal of Kidney Diseases.
14. Ercoşkun, H. (2025). Energy Drinks And Health Risks: A Review Of Composition, Consumption Patterns, And Regulatory Gaps. Selcuk Journal of Agriculture and Food Sciences, 39(3), 667-682.
15. Boateng, V., Mensah, A. N. K. O., Osei, F. & Teye, E. K. (2026). THE EFFECT OF EMPLOYEE ENGAGEMENT ON ORGANIZATIONAL PERFORMANCE IN GHANAIAN SMEs. IRASS Journal of Multidisciplinary Studies, 3(8), 49-57. http://doi.org/10.67564/IRASSJMS.v3.i8.0183
16. Mohamed, M. M., Khafaga, D. S., Daboun, H. A., El-Rahman, H. A. A., & El Desouky, M. A. (2025). Impact of maternal energy drink consumption during gestation and lactation on brain health in neonatal Wistar albino rats. Scientific Reports, 15(1), 30865.