



Asian Journal of **Biochemistry**

ISSN 1815-9923



Academic
Journals Inc.

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Effect of Carbonated Drinks on the Activities of Alanine Aminotransferase (ALT) and Aspartate Aminotransferase (AST) in Serum and Kidney in *Rattus novergicus*

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ABSTRACT

The effect of carbonated drink also known as pop soda was studied in this research. The aim of this study was to check the possible effect on the activities of the kidney biomarkers [alanine aminotransferase (ALT) and aspartate aminotransferase (AST)] in *Rattus novergicus*. The results from this study revealed that the activities level of serum ALT of group A (24.1 ± 5.8) showed a significant increase at ($p < 0.05$) when compared with that of the control C (10.0 ± 2.72) while that of group B (1.75 ± 1.66) showed a significant decrease in enzyme activity when compared with that of the control. It was also revealed that there was significant increase in AST enzyme activity in brand B (24.2 ± 6.38) when compared with that of the control C (17.0 ± 1.94) at ($p < 0.05$). The result from the investigation of kidney ALT and AST activities showed that there was a slight increase in AST activity with brand B (17.70 ± 1.68) when compared with that of the control (16.70 ± 2.52) at ($p > 0.05$), While the kidney ALT level for brand A and B were reduced when compared with that of the control ($p > 0.05$). The results of the study suggest that over consumption of carbonated drink may cause liver injury thereby increasing the liver enzyme activity, however overconsumption of carbonated drinks may cause problem to the kidney if there is alteration of kidney architecture. The results from the research showed that for healthy kidney, overconsumption of carbonated drinks may have no effect.

Key words: Carbonated drinks, carbonated beverages, kidney, pop soda, *Rattus novergicus* alaline aminotransferase, aspartate aminotransferase

INTRODUCTION

Coca cola and Pepsi cola are dark amber colored carbonated soft drinks with a sweet bubbly refreshing taste, flavoured with caffeine and cocaine hence they belong to the cola category of the broad family' of soft drinks commonly referred to as soda pop (Adjene *et al.*, 2010). The production of soft drinks dates back to early 17th century with the manufacture of artificial mineral water usually called soda in the United States of America (USA) in 1810 which was initially sold at Soda fountain attached to Pharmacist shops.

Sucrose is the major sweetening agent in soft drink. It is a disaccharide that contains equal parts of the monosaccharide fructose and glucose. High fructose corn syrup, was later preferred to sucrose as the sweetener of choice in the soft drink industry, mainly because it is cheap to produce

and can be engineered to contain varying amounts of glucose and fructose. It also extends the shelf life of products (Bray *et al.*, 2004). The fructose content of beverages sweetened with sugars range from 7 to 15% by weight (Drills, 1993).

Consumption of soft drinks, carbonated beverages, in particular, has increased markedly in the past two decades to three decades (Nielson and Popkin, 2004; Harnack *et al.*, 1999).

Soft drink consumption has been linked with obesity, type-2 diabetes, dental caries, low nutrient levels, osteoporosis and has shown to increase the risk of metabolic syndrome (Nimer *et al.*, 2008; Manuel *et al.*, 2006; Vartaman *et al.*, 2007; Malik *et al.*, 2006; Jugens *et al.*, 2005; Bray *et al.*, 2004). Kidney is very important in osmoregulatory activities by regulating electrolytes, maintenance of acid base balance as well as reabsorption of water, glucose and amino acids. They are also known to produce hormones including calcitriol, renin and erythropoietin.

Individuals consuming more than one soft drink per day have a higher prevalence of the metabolic syndrome than those consuming less than one drink per day.

In Nigeria, about 60-70% of babies are given soft drinks which include Coca-Cola, Pepsi cola and Seven-Up at parties for refreshment or at home before meal.

This study investigates the effect of carbonated drinks (using Coca cola and Pepsi as case study) on the activities of alanine aminotransferase and aspartate aminotransferase in serum and kidney in *Rattus norvegicus* (Wister rat).

MATERIALS AND METHODS

Animal care ethics: Fifteen *Rattus norvegicus* (Wister rats) of both sexes with average weight of 250 g were randomly assigned into three groups: A, B and C Groups A and B served as treatment groups while group C served as control group. The rats were obtained and maintained in the Animal Holdings of the department of Anatomy, School of Basic Medical Sciences, University of Benin. The animals were fed with grower's mash obtained from Edo feeds and flower mills Limited, Ewu, Edo State. Two brands of carbonated drinks were de-identified and branded A and B. They were sourced from the coca cola and Pepsi mini depot in Benin City, Edo State, Nigeria.

Carbonated drinks administration: *Rattus norvegicus* in the treatment groups A, were given fresh bottled content of Coca cola while treatment group B were given fresh bottled Pepsi liberally, on a daily basis for thirty days. This was repeated twice daily while the control group (C) was fed with equal amount of water for the same duration of time. *R. norvegicus* were then sacrificed by cervical dislocation on the thirty-first day of the experiment. Five millimeter of blood was collected and put in a test tube and spinned in a centrifuge for 15 min to obtain the serum and then the kidney was quickly homogenated with 10% normal saline for biochemical assay.

Biochemical assay: The measurement of enzyme activity was done using the spectrophotometer. ALT and AST activity were determined.

Statistical analysis: The results were expressed as Mean \pm SD. The student t-test was used for the evaluation of statistical significance. The results were judged significant if $p < 0.05$.

RESULTS AND DISCUSSION

Coca-Cola is produced by the Coca-Cola Company in Atlanta Georgia. It is enjoyed by both old and young people alike but has found more popularity among youths and children. Despite its

Table 1: ALT and AST level in serum of *Rattus norvegicus* after chronic consumption of carbonated drinks

Parameters	Control (C)	Treatment (A)	Treatment (B)
ALT (U L ⁻¹)	10.0±2.72	24.1±5.82 ^a	10.75±1.66 ^b
AST (U L ⁻¹)	17.0±1.94	18.90±1.34	24.20±6.38 ^a

Values are Mean±SD, n = 5, The superscripts represent significant differences of test groups in comparison with respective controls (p<0.05)

Table 2: ALT and AST level in kidney of *Rattus norvegicus* after chronic consumption of carbonated drinks

Parameters	Control(C)	Treatment (A)	Treatment (B)
ALT (U L ⁻¹)	40.20±1.68	20.20±1.15	20.50±0.87
AST (U L ⁻¹)	16.70±2.52	14.20±2.08	17.70±1.68

Values are Mean±SD, n = 5

popularity and satisfaction, Coca-Cola has in recent time come under intense scrutiny and criticism from health professionals, Nutritionist and researchers; who claim that the product is a source of health concern.

The consumption of carbonated drinks has been associated with obesity, type-2 diabetes, dental caries, low nutrient level and osteoporosis (Manuel *et al.*, 2006; Vartaman *et al.*, 2007; Malik *et al.*, 2006; Jugens *et al.*, 2005; Bray *et al.*, 2004).

The results from this study revealed that the activities level of serum ALT of group A (24.1±5.8) showed a significant increase at (p<0.05) when compared with that of the control C (10.0±2.72) while that of group B (1.75±1.66) showed a significant decrease in enzyme activity when compared with that of the control (Table 1). The implication of this result is that brand A may have effect on the liver due to over consumption leading to liver injury which leads to increased ALT activity but has no effect on kidney activity as long as the subject in question are healthy.

It was also revealed that there was significant increase in AST enzyme activity in brand B (24.2±6.38) when compared with that of the control C (17.0±1.94) at (p<0.05) (Table 2). The implication of this result is that brand B has some effect on the kidney activity while brand A has no effect. The effect of brand B on the kidney may be due to distortion of the osmoregulatory activity of the kidney as a result of kidney architecture alteration of kidney. This finding is in agreement with the findings of Adjene *et al.* (2010). They stated that soda pop drinks are capable of precipitating kidney disease probably by causing congestion and tubular necrosis of the kidney. The result from the investigation of kidney ALT and AST activities showed that there was a slight increase in AST activity with brand B (17.70±1.68) when compared with that of the control (16.70±2.52) at (p>0.05). While the kidney ALT level for brand A and B were reduced when compared with that of the control (p>0.05).

CONCLUSION

This research has shown that over consumption of carbonated drink may cause liver injury thereby increasing the liver enzyme activity, however overconsumption of carbonated drinks may cause problem to the kidney if there is alteration of kidney architecture. The results from the research showed that for healthy kidney, overconsumption of carbonated drinks may have no effect.

ACKNOWLEDGMENT

We are grateful to Mr. Kweki, Rume Godfrey of the Medical Biochemistry Department, Delta State University, Abraka-Nigeria for his technical assistance in carrying out this study.

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