

# Evaluation of Some Biochemical Indices in Male Albino Rats Administered With Instant Powdered and Energy Drinks

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**Abstract-** Drinks are common and alternative sources of energy and vitamins among all ages, but are sometimes associated with several health challenges. This work studied the phytochemical contents of Instant Powder drinks (Tang, Amila, Nutri-C, Eve cola, Sari- C and Kool 2go) and Energy drinks (Power Horse and London best) and the effects of their consumption on some biochemical parameters of male albino rats. The phytochemical screening of the drinks was carried out using standard methods. Total of forty- five male albino rats divided into nine groups of five rats per group were fasted daily for 12 h before oral administration of the tested drinks for 15 days, based on daily water intake of laboratory rodents. Animals were monitored for signs of toxicity and were sacrificed after 24 h of completion of the treatment. Blood samples were collected for biochemical examinations. Serum biochemical indices such as glucose, alanine amino transferases (ALT), aspartate amino transferase (AST), alanine phosphate (ALP), albumin (ALB) and total protein (TP) were evaluated. The tested drinks contain carbohydrate and lack many relevant phytochemicals. The administration of the drinks significantly ( $p<0.05$ ) raised the body weight of Amila and Sari - C treated rats and caused abnormal elevation of blood glucose of Tang exposed rats. However, rats that were treated with Kool 2go, Sari - C and London best experienced a significant ( $p<0.05$ ) increase in their liver enzymes. In conclusion, prolong intake of drinks such as Amila, Sari- C, Kool 2go, London Best and Eve cola should be avoided as this may cause damages to tissues including liver and pancreas.

**Index Terms:** Phytochemicals. Albino rats, Health, Liver, Glucose

## I. INTRODUCTION

Drinks or beverages include juice, soft drinks, and carbonated drinks. They are classified into alcoholic (ethanolic or hard) drinks and non - alcoholic (soft). Drinks are one of the

most consumed products in the world especially among teenagers and school children. In Nigeria, increased rate of modernization has led to a rise in availability of these drinks in the markets, thereby making it affordable for poor masses including elderly men and women. Consumption of soft drinks has become a highly controversial public health issue because they are considered as a major risk factor to obesity and related diseases [1]. Worldwide, soft drinks (Soda, Tonic, Mineral or Carbonated Beverage) contain water or carbonated water and additives such as sweetener and flavoring agent. They are fortified with lots of vitamins and minerals in other to serve as a medium of nourishing the body with required nutrient. Drinks are processed into powder form through drying to give Instant Powder drink for easy consumption at affordable prices. The processing affects the vitamin C content and increases the acidity of Instant Powder drinks [2]. The sweetener may be sugar or high-fructose corn syrup or a sugar surrogate in case of diet drinks. Drinks may also contain caffeine, fruit juice, or both [3].

Generally, daily consumption and production of soft drinks is on the increase and they have associated with a lot of diseases and damages such as bone fractures, dental caries, osteoporosis, hypokalemia, obesity, liver damage, reduced fibre and nutrients intake [4] [5].

Virtually all the additives in drinks have their attendant negative effects. Aspartame a non- saccharine sweetener is one of the most common saved food additives in drinks (especially Powder drinks). It is sugar substitute in some foods and beverages [6]. Over dose of aspartame causes brain impairment, phenylketonuria, memory loss and high blood sugar (diabetes mellitus). Caffeine is found in Energy drinks is known to stimulates the central nervous system, instigates

insomnia, irritation, rapid heartbeat, headache and many other diseases [7]. It reportedly induced liver damage in rats [8]. This study considered the effect of some locally manufactured Instant and Energy drinks in some biochemical indices of male albino rats.

## II. MATERIALS AND METHODS

### Collection and Preparation of Drinks

Tang, Amila, Eve cola, Nutri-C, Sari-C, London best, Power horse and Kool 2go were obtained from different provision stores in Ikorodu, Lagos State, Nigeria. They were made into solution based on manufacturer recommendations and administered according to the daily water required by the rats for 12 h using allometric equation. The concentration of hydrogen ion in each drink was determined by use of a pH meter. Fresh drinks were prepared daily and used for the study.

### Phytochemical Screening of Instant Powder and Energy Drinks

The under studied drinks were screened for the presence of secondary metabolites by use of standard protocols [9] [10].

### Experimental Animals

The animals (Male albino rats) were obtained from the animal house of College of Medicine, University of Lagos. They were housed in plastic cages with wood shavings as bedding and were given water and standard Grower feeds ad libitum. Animals were acclimatized for fourteen days under standard conditions.

### Experimental Design

A total of forty five male albino rats (140g- 180g) were distributed randomly into nine groups of five rats per group (Control, Nutri-C, Kool 2go, Amila, Eve cola, Sari-C, Power Horse, London Best and Tang Instant Powder drink). The animals were fasted daily for 12 h and were administered drinks orally based on daily water intake of laboratory rodent for 12 h as calculated by the use of allometric equation. They were monitored for signs of toxicity, change in body weight and feed intake during the 14 days of the experimental period. After the treatment period, the ratio of feed intake to the average body weight gain of the animals was calculated. Their blood sugar was taken before and at the end of experiments. Animals were sacrificed by cardiac puncture under anesthesia at 24 h after the study. Blood samples were obtained and centrifuged at 5, 000 rpm for 10 min to obtain serum. Sera were stored at -200C until required for biochemical assays according to method described by [11].

### Biochemical Studies

The under listed biochemical parameters as described by each procedure were determined using biochemical kits (Randox Laboratories, UK): Aspartate aminotransferase, AST [12]; alanine aminotransferase, ALT [13]; alkaline phosphatase and ALP [13].

### Statistical Analysis

Experimental results were presented as Mean  $\pm$  SEM for five independent treatments. Data were analyzed by the means of one way (ANOVA) using Statistical Package for the Social

Science (SPSS) Software 14. Duncan Post hoc tests were also performed.

## III. RESULTS

The results of the study varied according to the treatment. The hydrogen ion concentrations (pH) of the tested drinks ranged from 6.3 to 7.5 with "Amila" having the lowest (pH 6.3) while "Eve cola" has the highest (pH 7.5) (TABLE I). Preliminary phytochemical screening showed that all the drinks lack all the useful phytochemicals (tannins, saponin, flavonoids and phenolic) except "Eve cola" and "Power Horse" from which saponins were detected (TABLE II). All the drinks contained carbohydrate, but protein was not detected in all except in "Eve cola". At the expiration of the study, the fasting blood glucose of the animals was insignificantly ( $p>0.05$ ) altered compared to the control animals except for animals treated with "Tang" (TABLE III). The body weight and feed efficiency ratio of the treated rats decreased significantly ( $p<0.05$ ) except for the animals treated with "Amila" and "Sari-C" whose weight increased significantly ( $p<0.05$ ) (TABLE IV and TABLE V). TABLE VI reveals alteration in the activities of liver functions enzymes. Despite the fact that AST was significantly ( $p<0.05$ ) reduced by Nutri-C, Amila and Power Horse, the administration of Kool 2go, Sari-C and London best provoked a significant ( $p<0.05$ ) elevation of ALT. Moreover, the administration of all the instant drinks provoked a substantial ( $p<0.05$ ) increase in the activity of ALP. Most of the drinks (except Nutri-C) reduced the serum protein (albumin) or total protein (TP) significantly ( $p<0.05$ ) when compared with the control.

TABLE I: PH OF INSTANT POWDERED AND ENERGY DRINKS

Sample	Nutri-C	Kool 2go	Amila	Eve-cola	Sari-C	Power Horse	London Best	Tang
pH	6.4	6.7	6.3	7.5	6.5	6.8	6.5	6.6

TABLE II: PHYTOCHEMICAL SCREENING OF INSTANT AND ENERGY DRINKS

Sample	Tannins	Saponin	Flavonoids	Phe nolic	Carbo hydrate	Protein	Fat
Nutri-C	-	-	-	-	+	-	-
Kool-2go	-	-	-	-	+	-	-
Amila	-	-	-	-	+	-	-
Eve Cola	-	+	-	-	+	+	-
Sari-C	-	-	-	-	+	-	-
Power Horse	-	+	-	-	+	-	-
London best	-	-	-	-	+	-	-
Tang	-	-	-	-	+	-	-

TABLE III: EFFECT OF INSTANT POWDERED AND ENERGY DRINKS ON BLOOD GLUCOSE

Group	Blood glucose (Mg/dl) (Day 0)	Blood glucose (Mg/dl) (Day 15)
Control	87.40±0.62	88.60±5.41
Nutri – C	87.70±0.78	79.20±9.50
Kool 2go	90.10±1.10	96.60±18.16
Amila	102.00±1.40	101.00±12.45
Eve cola	107±0.32	121.20±42.72
Sari – C	85.00±2.11	72.80±4.71
Power Horse	89.00±3.20	110.80±38.32
London best	90.00±0.40	87.00±7.42
Tang	105±3.25	437.20±153.25*

Data are represented as mean± SEM (n=5). Where (\*) indicates means are significantly different at (P< 0.05) compared to control rats.

TABLE IV: EFFECT OF INSTANT POWDERED AND ENERGY DRINKS ON BODY WEIGHT GAIN

Group	Body weight Gain (G) (Day 15)
Control	4.36±0.05
Nutri – C	3.08±0.11*
Kool 2go	1.16±0.09*
Amila	5.00±0.09*
Eve cola	3.96±0.03*
Sari – C	5.00±0.08*
Power Horse	1.72±0.05*
London best	1.68±0.08*
Tang	2.72±0.01*

Data are represented as mean± SEM (n=5). Where (\*) indicates means are significantly different at (P< 0.05) compared to control rats.

TABLE V: EFFECT OF INSTANT POWDERED AND ENERGY DRINKS ON FEED EFFICIENCY RATIO

Group	Feed efficiency ratio
Control	0.61

Control	0.61
Nutri – C	0.58
Kool 2go	0.22
Amila	1.05
Eve cola	0.71
Sari – C	0.98
Power Horse	2.85
London best	2.68
Tang	2.05

Data are represented as mean± SEM (n=5). Where (\*) indicates means are significantly different at (P< 0.05) compared to control rats.

TABLE VI: EFFECT OF INSTANT POWDERED AND ENERGY DRINKS ON BIOCHEMICAL INDICE

Group	AST (UL <sup>1</sup> )	ALT (UL <sup>1</sup> )	ALP (UL <sup>1</sup> )	ALB (GdL <sup>1</sup> )	TP (GdL <sup>1</sup> )
Control	32.38 ±0.01	26.87 ±0.12	19.34 ±0.00	1.38 ±0.02	9.42 ±0.01
Nutri – C	14.19 ±0.02*	25.67 ±0.12	48.3 6±0.00*	1.93 ±0.02*	8.93 ±0.02*
Kool 2go	48.28 ±0.02*	33.82 ±16.11*	106.39 ±0.20*	1.12 ±0.01*	6.74 ±0.02*
Amila	46.53± 1.78*	27.30± 0.29	71.33 ±0.02*	1.37 ±0.01	8.76 ±0.02*
Eve cola	18.17 ±0.02*	21.24 ±0.63	78.58 ±0.01*	1.23 ±0.02*	8.66 ±0.01*
Sari – C	33.12 ±0.02	30.38 ±0.02*	54.41 ±0.03*	1.30 ±0.02*	8.18 ±0.02*
Power Horse	29.34 ±0.01*	18.85 ±0.02*	79.79 ±0.05*	1.20 ±0.03*	10.30 ±0.02*
London best	59.92 ±19.89*	35.10 ±1.35*	42.31 ±0.02*	1.16 ±0.02*	11.82 ±2.35*
Tang	33.12 ±0.02*	17.37 ±0.02*	82.21 ±0.12*	1.29 ±0.02*	8.08 ±0.02

Data are represented as mean± SEM (n=5). Where (\*) indicates means are significantly different at (P< 0.05) compared to control rats.

#### IV. DISCUSSION

All the under studied drinks were slightly acidic except "Eve cola" which has a slightly alkaline pH. and contained carbohydrate but no protein. The ideal pH of the mouth ranges from 6.5 - 7.5. It follows that the Instant Powder drinks ("Nutri - C" and "Amila") with pH below 6.4 have the tendency to cause erosion of tooth enamel. Alkaline drinks (Tang,, Kool 2go, Sari – C., Power Horse and London best) may cause death of intestinal flora [14] [15]. Saponins containing substances are known to act as anti-inflammatory agents. They are also known to precipitate and coagulate red blood cells according [16]. Hence, Eve Cola drinks and Power Horse may serve as anti – inflammation drinks.

High intake of carbohydrate and protein increases fat deposition and body weight. This is a direct cause of obesity [17]. Aside from this, such food causes an increased blood glucose level and over stress the insulin. The Tang drink might contain high level of carbohydrate which was not quantified in this study. A high carbohydrate diet is known to damage insulin secreting cells of pancreas and cause

hyperglycemia or diabetes mellitus; a condition where the cell is unable to adequately regulate blood glucose [18]. Therefore an abnormal elevation of fastig blood glucose of Tang treated rats may indicate a level of carbohydrate in the sampled Tang which damage the pancreas and cause diabetes mellitus.

All the animals exposed to Nutri -C, Kool 2go, Eve Cola, Power Horse and London might have experienced a reduced weight gain because of nutrient malabsorption due to aspartame or reduced appetite in the treated rats [19] [20] [21]. Contrarily, Amila and Sari C might influence the body weight as a result of increased lipid accumulation (obesity) which may cause cancer. The report which was made by Kushi et al. [22] reported that overweight individual may experience certain types of cancer (kidney, mouth and throat cancers). The liver is the main organ that removes harmful substances. It is exposed to different xenobiotics which may cause adverse effects on the hepatic cells [23]. AST is found in the liver and skeletal muscles (heart and kidneys) [24]. Alkaline Phosphatase (ALP) is also found in the liver as well bone [25]. Contrarily, ALT is only found in the liver; these enzymes are released during tissue injury into the blood stream. ALT and AST are largely used to evaluate liver damage. It follows that Kool 2go, Amila and London best contain active component(s) which probably damaged the tissue (liver and kidney), releasing these enzymes into the blood stream. This report is in accordance to report of Akande and Banjoko (5). A significant ( $p<0.05$ ) increase in the albumin or total protein levels of animals that were separately exposed to Nutri-C, Power horse or London best shows that denotes the fact that these drinks contain a substantial ( $p<0.05$ ) level of protein synthesizing nutrient like vitamin C which was not detected in this study. This may enhance the physiological activities of the animals. An elevated level of proteins in experimental rats has been reported by Iweala and Lawal [26].

## V. CONCLUSION

The results showed that the tested drinks lack important nutritional (protein and fats) and pharmaceutical agents such as phenolic, flavanoid and tannins. Prolong or frequent consumption of these drinks should be avoided since this may elicit liver damage, obesity and related nutritional disorders such as diabetes mellitus.

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