

تأثير المشروبات الغازية على بعض المتغيرات الفسيولوجية والكيموحيوية في ذكور الجرذان البيضاء

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الخلاصة

هدفت الدراسة الحالية الى التحري عن تأثير المشروبات الغازية مثل الكولا والميراندا في بعض المتغيرات الفسلجية والكيموحيوية في دم الجرذان البيض كوزن الجسم والهيموكلوبين وتركيز سكر الكلوكوز بالدم وكذلك تقدير مرتسم الدهون في مصل الدم والذي شمل الكوليسترول والدهون الثلاثية وتركيز البروتين الدهني منخفض الكثافة والبروتين الدهني عالي الكثافة وتركيز البروتين الكلي فضلا عن تركيز اليوريا والكرياتينين في مصل دم الجرذان المعاملة لمدة شهر واحد.

أوضحت النتائج وجود فروقات معنوية ($p \leq 0.05$) في بعض القيم مقارنة مع مجموعة السيطرة مثل الوزن الكلي للجسم وتركيز الكلوكوز ومرتسم الدهون في حين لم تظهر القيم الأخرى مثل تركيز الهيموكلوبين واليوريا وتركيز البروتين الكلي اي اختلافات معنوية مقارنة مع مجموعة السيطرة.

ان هذه النتائج تبين علاقة المشروبات الغازية وتأثيرها الضار في الصحة العامة، فضلا الى كونها من مسببات المتلازمات الأيضية كالسمنة و امراض القلب وداء السكر وارتفاع مستوى الدهون في الدم.

الكلمات المفتاحية: المشروبات الغازية ، متلازمة الايض ، السمنة ، امراض القلب

The Effects of Soft Drinks on Some Physiological and Biochemical Parameters in Male Albino Rats

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Abstract

The present study aimed to investigate the effects of soft drinks such as Cola and Miranda on some physiological and biochemical parameters in the blood of white rats such as body weight (B.W), hemoglobin (HB), blood glucose (B.G) concentration and estimation of lipid profile estimation which included: total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL-c), high density lipoprotein (HDL-c), total protein as well as estimating the concentration of urea and creatinine in the blood serum of male albino rats treated for one month.

The results showed significant differences ($p \leq 0.05$) in some parameters compared with control group like body weight, blood glucose concentration and lipid profile, while other values such as concentration of hemoglobin, urea and total protein showed no significant differences with control group.

These results show the relationship of soft drinks and their harmful effects on public health as well as their cause of metabolic syndromes such as obesity, heart disease, diabetes and high blood lipids.

soft drink , metabolic syndrom , obesity , heart disease :**Keywords**

Introduction

Soft drinks are a non alcoholic beverages that typically consists of carbonated water, a sweeteners, acid and natural or artificial flavouring agents. Other additions may include fruits or fruit juice, carbon dioxide, preservatives and colours (1). Many people believe that soft drinks are of greatest public health concerns and are the major cause for obesity and other health issues. They have consequently been targeted as a means to reduce the increasing prevalence of obesity particularly among children (2). The consumption of soft drinks has increased bone demineralization, hypokalemic myopathy, development of metabolic syndromes, diabetes mellitus and chronic urinary disease (3).

Soft drinks are to make world widely with a number of different kinds of flavors. At the present time, the quality, aroma and the flavour are very important and within consumers demanded of many types of beverages, in particular of fruit drinks. Therefore, company makers of soft drinks always try to maintain their products within

the highest quality standards including the flavour of their products. These drinks are defined as a beverages containing fruit juice and other constituents of nutritional and sugar and industrial substances, that are added to improve the appearance and stability of the product and to ensure its organoleptic properties as well as its reasonable life time (1).

Soft drinks which have only flavors, like the Cola beverages, were not contained the necessary component of the soft drinks made from fruit juice sugar like glucose and fructose. The amount of fruit juice added to the soft drinks is responsible for the high concentrations of sugars, since 98% of their total soluble solids are carbohydrates (4,5). Generally, sugar is added either to amend the taste of acid or to sweeten the drink. Moreover, minor ingredients such as organic acids and vitamins, the causative agents for acidifying and antioxidant respectively, might be found in those kinds of drinks (6).

The aim of this study was investigate the effect of soft drinks: (Cola and Miranda) on some parameters in male albino rat as body weight and hemoglobin, biochemical parameters like lipid profile and total protein, in addition to some measures of other biological components.

Materials and Methods

Animals Used:

Preparing the animals

Fifteen adult male albino rats has been chosen in order to control the hormone complication in female rats, weight (200 – 300 gm), age of (3 – 4) months have been used in this study. This study was carried out at the animal house at the College of Dentistry, University of Mosul during the period extended from October 2017 to February 2018. All animals kept in the same room under a constant temperature (22 ± 2)°C with food pellets and water available adlibitum.

Experiment Design:

The animals have been divided randomly into three groups, each one includes five rats treated for one month as follows:

1. Group (1) was kept with enough tap water as a control.
2. Group (2) was given cola beverage as a drink instead of tap water.
3. Group (3) was given miranda beverage as a drink instead of tap water.

Physiological and Biochemical Parameters analysis:

At the end of the experimental period body weight was recorded and blood samples were collected from each rat in clean centrifuge tube, by puncturing the retro-orbital sinus of the eye and was used for determining haemoglobin concentration followed Drabkin and Austin method (7) then blood serum was separated by centrifugate at (3000) rpm for (15 min.) to determine total protein by a total protein kit (Randox. Co., UK), Serum cholesterol was measured using cholesterol kit (Biolabo - France), triglyceride was measured by triglyceride kit (Biocon. Germany) and (LDL-c) was estimated according to Tietz (8). Fasting blood glucose level was estimated by O-toluidine method by Sasak, *et.al.* (9). High density lipoprotein estimated using kit (Bio merieux - France). Urea and creatinine was determined using urea kit (Bio merieux - France), creatinine kit (Randox Co. UK) respectively.

Statistical Analysis:

The data were analyzed statistically by using one - way analysis of variance (ANOVA) and group differences were determined by Duncan's multiple range test. The results were expressed as Mean \pm S.E. ($p \leq 0.05$) and considered statistically significant (10).

Results

The results in table (1) showed There was a significant increase ($P < 0.05$) in the body weight, In contrast, no significant changes in hemoglobin concentration documented in the treated groups compared with the control group. Table (2) showed the changes in lipid profile of blood serum in rats exposed to soft drink, a significant increase ($P < 0.05$) can be seen at the concentration of total serum cholesterol, triglycerides, (LDL-c) compared with the control group, While there are no significant differences in (HDL-c) concentration compared with control group.

Table (3) showed the effects of soft drinks on serum urea, creatinine, total proteins and glucose concentration in blood serum of rats. There were no significant differences between the different groups. A significant increase ($P < 0.05$) in creatinine and glucose in urea, total proyein in the groups compared with the control group.

Table (1): The changes of body weight and hemoglobin concentration after exposure to soft drinks for one month.

Parameters Groups	Body weight (g)	Hemoglobin cocntration (g/dl)
Control	b 210 \pm 5	b 11.65 \pm 0.7
Treated with Cola	a 300 \pm 5	b 9.32 \pm 0.32
Treated with Miranda	a 290 \pm 5	b 10.21 \pm 1.05

The number of animals per group = five
 Values are expressed as mean \pm S.E.
 Different letters with columns indicate significant differencees at ($p \leq 0.05$) .

Table (2): The changes in lipid profile in blood serum after exposure to soft drinks for one month.

Lipid profile Groups	TC. Con. (mg/dl)	TG. Con. (mg/dl)	(LDL-c) Con. (mg/dl)	(HDL-c) Con. (mg/dl)
Control	b 50.27 ± 2.8	b 22.82 ± 1.2	b 18.16 ± 4.2	b 27.23 ± 0.27
Treated with Cola	a 64.51 ± 4.1	a 40.12 ± 3.2	a 29.72 ± 5.7	b 25.77 ± 2.3
Treated with Miranda	a 59.42 ± 3.1	a 39.32 ± 1.2	a 28.63 ± 2.5	b 25.65 ± 1.3

The number of animals per group = five
 Values are expressed as mean ± S.E.
 Different letters with columns indicate significant differences at (p ≤ 0.05) .

Table (3): The changes in urea, creatinine, total protein and glucose concentration in blood serum of rats after exposure to soft drinks for one month.

Parameters Groups	Urea con. (mg/dl)	Creatinine con. (mg/dl)	Total protein con. (g/dl)	Blood glucose con. (mg/dl)
Control	b 24.6 ± 2.3	b 0.39 ± 0.03	b 7.2 ± 0.2	b 90.5 ± 6.7
Treated with Cola	b 25.2 ± 1.1	a 0.44 ± 0.02	b 6.6 ± 0.02	a 167 ± 11.8
Treated with Miranda	b 26.8 ± 3.1	a 0.45 ± 0.02	b 7.0 ± 0.2	a 159 ± 9.7

The number of animals per group = five
 Values are expressed as mean ± S.E.
 Different letters with columns indicate significant differences at (p ≤ 0.05) .

Discussion

The present study demonstrated that the consumption of soft drinks like Cola and Miranda has increased the risk of diseases as diabetes type 2 and increase obesity and heart disease. Many epidemiological studies have addressed the relation between consumption of soft drink and risk of type 2 diabetes conducted a prospective analysis of soft drink consumption and risk of weight gain, these results closed to Malik's *et.al.* results (11). Data from the Framingham Heart Study in the USA showed that consumption of greater than 1 can of soft drink (350ml) per day increased the risk of obesity and metabolic syndrome, disruption fasting glucose, higher blood pressure and LDL, these converged with the results of Dhingra *et.al.* (12). The sweeteners in soft drinks consist of a high caloric more than ordinary sugar and induce hormonal and physiological responses that lead to weight gain as Xavier *et.al.* results (13). Caffeine found in soft drinks causes to allow adrenaline which may cause to a rise in blood sugar as in the result we obtained comparing with Vartanian *et.al.* (2) and Frank's results (14). The pancreas then reply by secreting insulin which in turn, reduces blood

sugar concentration to enter into cells for oxidation and energy production. Then excess sugar stores in the form of fat. A can of soft drink contains about 10 teaspoon of sugar. Thus, excessive consumption exceeds the WHO recommended a 10% limit of calories intake from added sugar, this causing high glucose levels blood is permanently and injury diabetes specifically type II diabetes (2,14).

These results mean to increase the risk of developing of injury metabolic syndrome, this syndrome is a group of criteria such as " central obesity, hypertention, high blood sugar, elevated fasting triglycerides and low concentration of (HDL-c) or 'good' cholesterol", that's match with Frank's results (14).

The urinary disease has been found to be associated with the intake of phosphoric acid based soft drinks but not the citric acids as in the results we obtained by comparing them with Frank's results (14). A soft drink consist of citrus fruit juice and grapefruit juice may be lead to the formation of renal stone. Still, citrus fruit juices could represent a natural alternative to potassium citrate in the management of nephrolithiasis, because they could be better tolerated and cost effective than drugs (15,16).

As well as soft drinks has no nutrients, they also contain harmful substances or chemicals(17). Their high sugar content, specially high fructose juice can cause diabetes and affect to heart and liver, preservatives like phosphoric acid can cause osteoporosis and urinary disease(18). Likewise, citric acid can cause severe dental erosion. The caramel color in cola and the chemicals in the containers are also linked to cancer (17,18).

The results of this study investigating the association between Cola and Miranda consumption and increased risk of overweight and metabolic syndrome. As well as caffeine, Cola and Miranda consist of a large amount of glucose and a high concentration of fructose syrup. The excessive consumption of these preparations may lead to hyperglycemia. Fructose itself may cause renal damage. Other components in cola such as phosphorus may reveal significant physiological action.

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