

## Zero Sugar Soft Drinks (Beverages) Are Not Really Free of Sugar Could Lead to Diabetes at High Consumption

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### Abstract

Fasting blood glucose (FBG) was determined in male and female albino rats for 28 days in the oral administration of zero sugar coke, and sugary coke, sprite and dubic malt. There was a steady rise of blood glucose level from day 7 to day 28 and was significant ( $P < 0.05$ ) in rats fed with zero coke compared with sugary coke malt and low sugar malt. However, sprite had the highest blood glucose level and very significant  $P < 0.05$  compared with all the drinks. This was followed by coke and lastly malt. It is concluded that the zero i.e. Non sugar labelled coke is not really zero but with sugar content and it is likely to cause diabetes in its high consumption. The consumption of other soft drinks e.g. malt, sugary coke and sprite should be drastically reduced to avoid the burden of diabetes. The acute toxicity test (LD50) done revealed that all the soft drinks studied are safe for consumption.

**Keywords:** Soft drinks, glucose levels, diabetes.

### INTRODUCTION

The market is flooded with labelled low or zero soft drinks. This is done to attract consumers of such drinks and mainly to assure such persons of disease free drink like diabetes. But this is far from the truth as many of such drinks have high percentage of sugar. Sugary foods are not really bad as such are the source of energy fuel in the body.

However, when such sugar is of high concentration it results in a metabolic disease called diabetes. Soft drinks have peculiar characteristics of the taste and flavour and with quenching taste properties as in coke, (Phillip 2013). Sugar is meant for sweetness, but there are other contents e.g. carbonated water necessary for taste quenching and then the flavouring agents for the flavour that attracts consumers (Kirk 1991). Other components of soft drinks are vitamins, phosphates acids, antioxidants with nutritional properties' (Pofahl, 2005). However, some traces of heavy metals e.g. cadmium, lead, mercury arsenic zinc, have been found in soft drinks as a result of the process of production and environmental pollution (Engwa, 2015). Contamination of soft drinks by micro organisms is found to result in alcohol present in the drinks. All these need to be visited for safety consumption otherwise these contaminants may be more dangerous than the sugar contents which may be controlled but heavy metal effects are not likely to have remedy.

Consumption of high amount of sugary food is linked with diabetes and in Nigeria soft drinks are the most consumed beverages, (FAO, 2011). It means diabetic rate is also likely to be high.

Diabetes is characterized by disordered metabolism and hyperglycemia i.e. high blood glucose level. Diabetes can also result due to low insulin production or its resistance or the insensitivity of its receptor. Basically, diabetes do occur when the pancreas does not produce enough insulin to regulate the blood glucose level or the body cannot effectively utilize the insulin produced (WHO, 1999). There are three types of diabetes types 1 and typed 2 and gestatimal diabetes. Type 1 also known as insulin dependent diabetes mellitus (IDDM) is characterized by deficient insulin production due to the destruction of pancreatic beta islet cells by auto-immune system (Kyi, 2015). It could be hereditary leading to the degeneration of beta-cells and insulin is the hormone necessary for the glucose to enter the body cells to produce energy. It is found in children and adult without cure but could be managed. There is also gestational diabetes which occurs mainly in pregnant women (Linsay 2009) (Fujimolo 2013). Diabetes symptoms generally include thirst frequent urination, bed wetting in children with no such episode before, weight less, blurred vision, hunger, weakness and fatigue. Clinically, it is classified as polyuria due to decrease tubular absorption of water as a result of loss of glucose in urine that causes osmotic dluresis (Richard 2005) increase urination leads to thirst as the fluid and hyperglycemia increases the osmolarity of the plasma,. This will stimulate the thirst centre and hence increase water intake, in polydipsia. There is polyphagia, here the body is unable to utilize the high glucose in the blood. Thus, the cells are deprived of glucose hence hunger (Pawar, 2017). In type 2 diabetes known as (NIDDM) non insulin dependent diabetes mellitus; the symptoms are often similar or may be absent or less. This is why many may have this type of diabetes unnoticed until at high level complications. It characterized by impaired glucose tolerance. This is due to ineffective utilization of insulin i.e. the cells are unresponsive to insulin, a situation of insulin resistance (Olokobam 2012). Many persons suffer from this type of diabetes. The basic causes of type 2 diabetes are obesity, hereditary, lifestyle, cholesterol level, non physical exercise. Persons who eat high fat food that lacks fibre and are overweight are at risk of type 2 diabetes. But the major cause of type 2 diabetes in insulin resistance i.e the body produces such but reject it. Persons with type 2 diabetes are at risk of heart, (Barengo, 2008) (Fring 2009), disease as high blood glucose damages the blood vessels and nerves hence heart disease. But the observed persons have additional pressure in the body to utilize insulin and control the blood glucose levels. Apart from the heart there is the diabetes retinoporthy, which affects many people leading to blindness. The blood glucose levels can cause damage to small blood vessels in the retina. This is a light sensitive layer of cells. The damage cause weak abnormal blood vessels and leakage of fluids from the blood vessels. However, type 2 diabetes could be treated and managed by diet and lifestyle control. The normal blood glucose level is 60-120mg/dl but this fluctuates daily before with many antidiabetic agents; both orthodox and herbal available diabetes still rank the most important disease linked with high mortality in men and women almost advancing to about 2 million deaths annually. It is classified the leading cause of death in women, globally (WHO, 2016). About 422 million people are living with diabetes globally, (Matters, 2014). In Nigeria about 1.7 million people are living with diabetes (Bukola, 2016). The complications in blindness kidney failure – (2017) lower limb computation (Moxey, 2011) and stroke are highly associated with diabetes (WHO 2017).

**Materials and Methods:** A total of thirty (30) male and female adult, albino, wistar rats weighing 110-180g and 27 albino mice (17-30g) were used for the study. They animals were kept in the Faculty of Pharmacy University of Uyo and animal house and were fed with pellets and sterile water. The animals were maintained according to the regulation of institute of animal and ethical committee (IAEC) of Helsinki 1964.

**Grouping and Preparation of the Soft Drinks:** The following soft drinks were used, coke, zero-coke, sprite and low sugar champ malt, dubic malt. The drinks were purchased from a central supermarket in Uyo and kept at room temperature. The animals were grouped per soft drink type and 5 rats per-groups of 6 and control group were done as follows: Group 1 = control distilled water group 2: Sprite, Group 3 = zero coke, Group 4 = Cham malt low sugar, group 5, coke. Group 6, dubic malt. The drinks were administered per body weight orally using canula by-passing the esophagus into the stomach, (Robert, 1979).

**Acute Toxicity Test (LD50):** Lorke’s method 1983 was used in assessing the toxicity if any in the drinks. A total of 27 swiss albino mice were used for the study. They were divided into 3 groups with 9 in each group. The animals were administered with the soft drinks intrapentoneally per body weight. The animals were given the different soft drinks based on the total content i.e. volume per their body weight and by the weight of human being (70kg). The calculated dosages were 0.85cl/kg (8.57ml/kg) for zero coke, coke and sprite and 0.47cl/kg (4.71ml/kg for malt. There was no mortality and so no lethal dosage was calculated which would have been the dosage that killed and that which did not kill. The soft drinks were found to be very safe as there were no physical signs of toxicity observed after 24 hours of the administration of the drinks.

**RESULTS: Fasting blood glucose levels in sprite zero coke, champ malta, coke and dubic malt**

Gro ups	Soft Drinks	Initial Fasting glucose level mg/dl	Initial blood glucose level Day 7	Initial blood glucose level day 14	Initial blood glucose level day 21	Initial blood glucose level day 28
1	Distill H <sub>2</sub> O 10ml/kg control	85.14 ± 8.76	90.57 ± 3.99	89.86 ± 5.43	92.14±4.74	92.75±5.99
2	Sprite	91.63±4.07	107.25±4.62	117.00±3.55	120.63±4.03	126.50±4.41
3	Zero coke (Non sugar)	88.29±.10	96.00±4.36	98.29±3.20	101.29±4.54	111.43±2.76
4	Cham Malta (low sugar)	89.13±5.99	99.75±5.18	107.38±3.42		111.13±4.29

5	Coke (sugar)	92.75±.30	100.76±1.71	109.003±.74	116.00±2.94	124.50±3.49
6	Dubic Malt	91.33±7.02	106.33±3.06	110.00±2.65	115.33±3.22	120.67±2.51

The five groups of animals showed should normal range of blood glucose at initial tasting level .85.14 + 8.76 – 92.75+5.99. Table 1, but at the administration of the soft drinks the glucose level rose. In group 2 with sprite the blood glucose level was 107.25 ± 4.62 on day 7, significantly greater (P< 0.05) than initial fasting glucose level but within the normal range. On day 14, it was 117.00 ± 3.55 significantly greater than day 7 (P<0.05) and as compared to control group. On days 21 and 28 the blood glucose level were 120.63±4.03 and 126.50 ± 4.14 (P<0.05). For group 3 (Zero coke) the blood glucose levels for days 7, 14, 21 and 28 were 96.00 ± 4.36, 98.29 ± 3.20, 101.29 ± 4.54 and 111.43±2.76 significantly greater than control, (P<0.05). In group 4 with low sugar champ maltar, the blood glucose levels for 7, 14, 21 and 28 days were as follows: 99.75 ± 5.18, 103.63±4.81, 107.30± 3.42 and 111.13±2.76 respectively results were significantly different as compared with control, (P<0.05). For coke in group 5 the blood glucose levels for 7, 14, 21 and 28 days were; 100.75 ± 1.71, 109.00 ± .74, 116.00 ± 2.94 and 124.50± 3.49 respectively. For dubic malt in group 6 the blood glucose levels for 7, 14, 21 and 28 days were; 106.33± 3.06, 110.00±2.65, 115.33±.22 and 120.67±2.51 respectively.

**DISCUSSION**

The study have revealed the presence of sugar in all the soft drinks studied including the ones tagged low or zero sugar. However, animals fed with coke, sprite and dubic malt have significant increase in blood glucose level compared to animals fed with low sugar champ malta and zero coke. This implies that are indeed soft drinks with low sugar contents. But the zero coke is not actually zero i.e absent of sugar as labelled because the results showed steady and significant increase of blood glucose level from days 7 – 28 days. The implication is that the continuous intake of the zero coke can increase the blood glucose to the disease (diabetes) situation. The manufacturer of zero coke should review the contents and check if there is adulteration of the zero coke labelled drinks. It is very dangerous to inform any one to take something which could endanger ones health in the pretence of being good. Consumption of sugary or sweetened beverages and high intake of soft drinks are potential agents for diabetes, (Gibson, 2008). Apart from zero coke many people do consume sprite believing it has low sugar content. This study has shown that sprite contains high sugar level that all other soft drinks. This means its high consumption can lead to diabetes, and dental caries, elevated blood pressure and likely cardiovascular disease, (Colchero, 2015) (Li, 2008). These holds for all sugary soft drinks. People are advised to reduce intake of sprite or completely abstain from consumption. The manufacturer of sprite should also reduce the sugar content to protect the consumers. In the study coke ranked second to sprite in high blood glucose content as the days of consumption increased. Coke is appreciated by greater percentage of population globally because of its outstanding flavouring taste (Coca-Cola 2011) which is sometimes irresistible. This attribute is also a source of the likely danger of diabetes in its high consumption. There are people which all their meals

must go with coke without water, a very big danger. The caffeine content in coke if consumed at high rate can cause gastric ulcer, Jimmy, 2017. As a stimulant it affects the central nervous system, mobilization of intracellular calcium and inhibition of enzyme e.g. phosphoric esterase, it decreases cerebral blood flow leading to hypo perfusion (Guyton 2006). There is alertness, associated fatigue due to its psycho stimulant effect including those of anxiety and sleep etc, (Nehiliq 1992) of recent many people have opted for dubic malt through it has no labell of low-sugar. But information is that it has low sugar and so many do consume it. This is perhaps due to the light sugar taste it has as compared to other malt drinks. Dubic malt in the study has shown increase blood glucose level as its duration of consumption increases. However, such level of increase was within the normal blood glucose range. But it is cautioned that high intake should be curtailed. It contains high carbohydrate, low protein and fat with high energy. The high carbohydrate content is a source of worry for its likely associated diabetes properties. Champ malta (low sugar) recorded low blood glucose levels almost ranging with zero coke. The blood glucose level was lower than zero coke on the 28 days. This is actually a confirmed low sugar malt drink. But since the blood glucose level seemed to be increased in durational consumption such need to be reviewed to avoid tendency of diabetes. In all, regular consumption of sugar sweetened drinks is associated with hyperglycemia and the high risk of diabetes, (Yoshida, 2007). There is need to withdraw from high consumption of soft-drinks and drink more water instead.

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