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High Glucose Levels in Maltina, Coke, Sprite and Bitter Lemon; Tendency For Diabetes

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ABSTRACT

Blood glucose levels were studied in thirty male and female rats fed with bitter lemon, coke. maltina and Sprite for 28 days. They were divided into six (6) groups with five rats in each group. Groups 1 served as control given 10mlkg of distilled water, group 2 was alloxan induced diabetes, group 3 fed with coke, group 4 with sprite, group 5 with bitter lemon, and group 6 with maltina. There was significant increase ($P<0.05$) in blood glucose level in group 3 on day 7. 14, 21 and 28 days as compared to control. Also in group 4, there was significant increase ($P<0.05$) in blood glucose level on day 7, 14, 21 and 28 days as compared to control and was significantly lower ($P<.005$) than that of coke in group 5. The blood glucose levels were lower on day 7. 14, 21 and 28 than those of coke and sprite but within the range on day 7 and 28 days in control. In group 6 with maltina the blood glucose level was within the range compared to control on day 7 but significantly higher ($P<0.05$) on day 14, 21 and 28 than those of group, 3, 4, 5 and those in control. It is concluded that Maltina, coke and sprite have the tendency of causing diabetes with the high glucose levels associated with their intake. But the LD_{50} carried out in the study has confirmed the safety of the drinks for consumption.

Keywords: Bitter Lemon, Coke, Sprite, Maltina, Glucose levels, diabetes.

INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by hyperglycemia, polyuria, polydypsia. It is associated with vascular and renal dysfunction, hypertension dyslipidaemia and arterioselerosis, (Dhurmasena, 2010). It is the disease cause by high blood glucose level as a result of insufficient insulin to metabolize the excess glucose in the blood. It could also be result in the inability of the pancreas to make insulin. Hence it is grouped into type I and type II which the former is insulin dependent diabetes IDDM and type 2 NIDDM. Thus, the blood glucose level is a sensitive indicator in assessing diabetes, as hyperglycemia and hypoglycenua. (Arun.2002). There is also the gestational diabetes (GDM) during pregnancy but with long term risk as type 2 (Bellamy, 2009), (WHO 2013).

Soft drinks are so called as such are non alcoholic drinks highly consumed globally. The demand is high due to the sugary content. It is sweet in the mouth and could be taken with snacks, bread, biscuits other cooked foods e.g rice, ripe plantain etc. it can be taken without any other thing. It is mostly consumed in the dry weather with its satisfying taste and seeming ability to also quench such taste. Hence these drinks are highly consumed. It is on this basis that the study was designed mainly to find out if these drinks could cause health threat as in diabetes and to create awareness on the danger of excessive consumption of these drinks. There is association between high intake of sugar sweetened beverages, and risk of type 2 diabetes, high blood pressure (Ley, 2004), over weight and diabetes, (WHO 2015), (Vazquez, 2007). Smoking is also associated with type-2 diabetes (Luo. 2013) (Willi 2007). Diabetes complication includes heart disease, stroke, neuropathy, (Wend land 2012). It may lead to foot ulcer, and infection as foot diabetes which result in amputation. Diabetes may result in blindness, retinopathy due to damage to small vessels in the retina. It can also cause kidney failure, (Wong. 2013). Diabetes in pregnancy can lead to fetal congenital malformation, still birth, obstetrics complications, and with high degree of mortality (WHO, 2016).

MATERIALS AND METHODS

Four soft drinks were used in the study, bitter Lemon, coke, sprite and maltina. The drinks were bought from authentic Super-market in Uyo Metropolis, Akwa Ibom State, Nigeria.

Acute Toxicity Test LD$_{50}$: The acute toxicity of the drinks were tested using Lorke's methods 1983, on 36 albino mice weighing average 15-30g to find out if the drinks are safe for consumption. A bottle of coke, sprite, bitter lemon and maltina contains 500ml i.e 50Cl. Taking 70kg body weight as averagely of man, the unit intake of such was given per weight of the animals as 0.714Cl/kg (7.14ml/kg) and translated per weight of mice (0.1-0.2ml). Thirty six (36) mice were divided into four groups with 9 in each group for the different soft drinks. The animals were sub grouped into three for intraperitoneal doses of 0.714CL/kg (7.14ml/kg) (0.1-0.2ml) 1.428Cl/Kg (14.28ml/Kg) (0.2-0.3ml) and 2.14Cl/Kg (21.42ml/kg) (0.5-0.6) and the drinks were administered according to their body weight. The first groups were given (7.14ml/kg) the second group, 14.28ml/kg, and the third group, 21.42ml/kg, based on their body weight. The animals were observed for physical signs of toxicity and there was none and there was no mortality recorded. Thus, there was no lethal dose to be calculated which could have meant the square of the products of dose that kills the animals and that which did not kill the animals. This test has confirmed that, bitter lemon, coke, sprite and maltina are very safe for consumption.

Animal: Thirty (30) adult male and female albino rats weighting between 110-180g were used for the study. The animals were maintained in a well ventilated University of Uyo, department of pharmacology animal house. The animals had access to clean water and pellets. They were grouped as follows. Groups 1 control, given 10ml/kg of distilled water, group 2 was given 150mg/kg (5%) of alloxan in diluted water group 3 was given 7.14 ml/kg of coke, water and pellets, group 4 was given 7.14 ml/kg of sprite with water and pellets, group 5 was given 7.14 ml/kg of bitter lemon with water and pellet while groups was given 7.14 ml/kg of maltina with water and pellets.

The drinks were administered orally using canula by-passing the esophagus and delivered into the stomach (Jimmy 2014) (Bertram 2004) (Robert 1979).

The animals were cared for according to the regulation of the Institute of Animal Ethical Committee (IAEC) and all ethical standard laid down in 1964 declaration of Helsinki were observed.

Alloxan Induced Diabetes: A single dose of alloxan 50mg/kg^{-1} was administered as 5% W/V distilled water. The preparation was injected intraperitoneally in 14-18hrs hours fasted rats. And they were allowed 72 hours of rest for glucose stabilization (William Son et al 1996) before the inducement, initial blood glucose were measured using glucometer.

Blood Collection and Fasted Blood Glucose Level:

The tails were sterilized with methylated spirit and cut. The first drop of blood was not taken for likely clotting. The second blood was applied directly to glucometer strip and the glucose levels measured for 7.14,21 and 28 days.

Statistical Analysis: One way analysis of variance (ANOVA) was used at 5% level of significance and the results expressed as means plus or minus standard deviation.

RESULTS:

The study has shown variations in the glucose levels in the different soft drinks. The mean glucose levels in coke and sprite were significantly ($P < 0.05$) increased on day (7) 115.80$\pm$4.38mg/dI and 118.80$\pm$ 11.80mg/dI respectively compared to control, 106.6+ 4.39mg/dI. However, there was no significant difference ($p > 0.05$) between these results and that of alloxan induced diabetes, 117.80$\pm$8.32mg/dI. Table I fig 1-4.

Animals given bitter lemon had blood glucose level of 107.40$\pm$8.32mg/dI not significantly different ($p > 0.05$ from alloxan induced group on day 7 and those given maltina with glucose level of 106.00+9.41 but were within the range, i.e decrease and also as compared to alloxan induced diabetes. Table 1.1 fig. 1-4, On day 14 the mean glucose levels were increased in the groups given coke, sprite, bitter lemon and maltina: 131.20$\pm$15.64mg/dI, 22.60$\pm$9.74mg/dI, 117.80$\pm$10.18mg/dI and 129.80$\pm$0.99mg/dI respectively as compared to control and alloxan induced diabetes group. Table 1 Fig 1-4.

Table 1.1: Comparative effects of Coke, Sprite, Bitter Lemon and Maltina on Fasting Blood Glucose Level

Groups	Drugs	Initial Fasting Blood Glucose Level (mg/dI)	Fasting Blood Glucose Level on Day 7 (mg/dI)	Fasting Blood Glucose Level on Day 14 (mg/dI)	Fasting Blood Glucose Level on Day 21 (mg/dI)	Fasting Blood Glucose Level on Day 28 (mg/dI)
1.	10m/kg of distilled water (control)	98.80$\pm$ 11.41^a	106.6 0 $\pm$ 4.39^a	108.00$\pm$ 6.58	108.00$\pm$ 6.20	104.00$\pm$ 3.67
2.	Alloxan 150mg/kg (control)	108.60$\pm$ 9.15^a	117.80$\pm$ 8.32^a	124.40$\pm$ 5.32^a	133.80$\pm$ 9.26^a	137.40$\pm$ 10.21^a
3.	Coke 7.14ml/kg	103.80$\pm$ 12.38^a	115.80$\pm$ 4.38^a	131.20$\pm$ 15.64^a	129.80$\pm$ 12.38^a	132.40$\pm$ 13.01^a
4.	Sprite 7.14ml.kg	108.00$\pm$ 7.35^a	118.80$\pm$ 11.80^a	122.60$\pm$ 9.74^{ab}	124.2 0$\pm$ 6.46^{ab}	127.60$\pm$ 8.35^{ab}

5.	Bitter Lemon 7.14ml/kg	107.80 ± 6.83^a	107.40 ± 4.39^{bcd}	117.80 ± 10.18^{bcd}	113.80 ± 9.65^{bcd}	106.80 ± 9.83^{bcd}
6.	Maltina 7.14ml/kg	97.20 ± 11.99	106.00 ± 9.41^{bcd}	129.8 ± 10.99^{ae}	128.20 ± 6.61^{ae}	140.40 ± 7.83^{acde}

Values are presented as Mean $\pm$ Standard Deviation.
a= significantly different from group 1 (p<0.05)
b= significantly different from group 2 (p<0.05)
c= significantly different from group 3 (p<0.05)
d= significantly different from group 4 (p<0.05)
e= significantly different from group 5 (p<0.05).

On day 21, the coke group had mean glucose level of 129.80mg/dI $\pm$ 12.38: 124.2+6.46mg/dI for sprite bitter lemon, 113.80+9.65mg/dI, maltina: 128.20+ 6.61mg/dI: a slight reduction in the glucose concentration compared to alloxan induced diabetes. Table 1. Fig 1-4.

On day 28, there was increase in the mean glucose level in the coke group, 132.40+13.01, also in sprite: 127.60+8.35, but reduction in bitter lemon: 106.80+9.83mg/dI and significant increase (p<0.05) in maltina group: 140.40+7.83 as compared to control and alloxan diabetes induced group. Table 1. Fig 1-4.

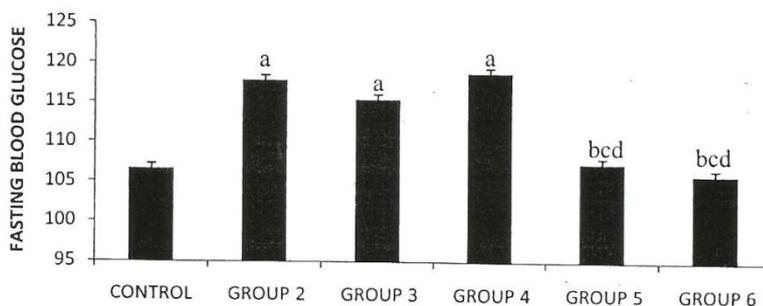Normal fasting blood glucose level should be less than 110mg/dI or ranges between (80-120mg/dI).

Figure 1   Comparative effects coke, sprite, bitter lemon and maltina on fasting blood glucose level on day 7 of administration
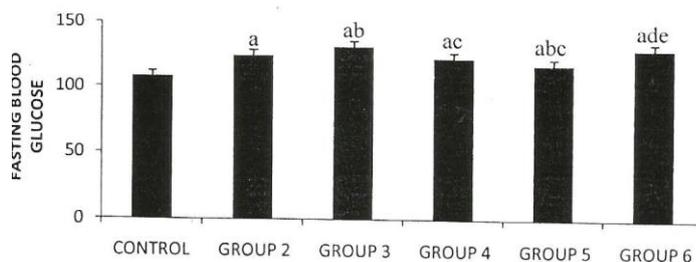

Figure 2   Comparative effects coke, sprite, bitter lemon and maltina on fasting blood glucose level on day 14 after of administration
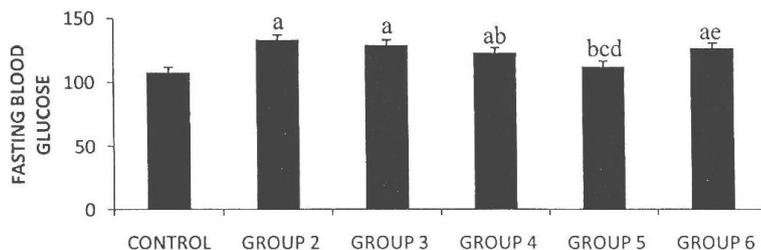
Figure 3   Comparative effects coke, sprite, bitter lemon and maltina on fasting

blood glucose level on day 21 of administration
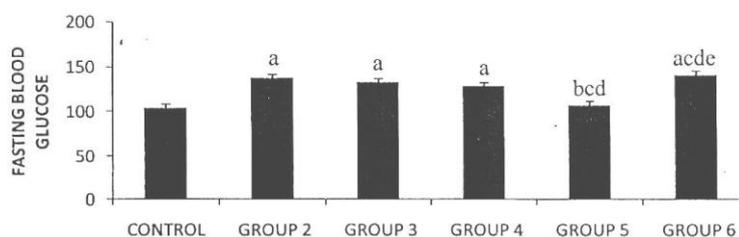

Figure 4   Comparative effects coke, sprite, bitter lemon and maltina on fasting

blood glucose level on day 28 of administrations

a = significantly different from group 1 (p<0.05)

b = significantly different from group 2 (p<0.05)

DICCUSSION

The study had shown the levels of glucose concentration per the drink for the period ranging from seven days to twenty eight days. The period was designed to quantitate the effects of continuous intake of the drinks on the blood glucose levels. For instance, on the seven day, there was minimal rise in the blood glucose level indicating the dose per period. And at the fourteen day of the feeding there was increase in the blood glucose levels in the soft drinks intake. But different results of decrease were observed on twenty one day but slight decrease in coke group, sprite and maltina. These results indicate glucose tolerance, whereas on the 14 day, it was not so. It means that the body started adjusting to the increase glucose levels by the moping action of insulin. (Guyton, 2011). But on seven day, there were degree of glucose intolerance can indication of hyperglycemia which is a pre-diabetic situation e.g diabetes type 2 (Salmeron, 1997) which also mean impaired glucose tolerance. However, the reduction in the glucose level on day 21 also mean the availability of insulin to overcome the insulin resistance that must have been the case on day fourteen which the beta cells failed to be sensitive to the need of insulin of the body. But there were increase glucose levels on day twenty eight in the group of coke, sprite and maltina. This means the failure of the body again for the production of insulin to cope with the glucose, level. Importantly, the blood glucose levels in coke and maltina were higher than that of control and mostly that of alloxan induced diabetes group. This is a confirmed situation of diabetes as normal blood glucose level should be less than 110mg/dI or ranges between 80-120mg/dI. Intake of sugary drinks is associated

with increase blood glucose level, Obesity, cardiovascular disease and type 2 diabetes (Gibeon, 2008) (Colditz, 2009). It also means that coke, sprite and maltina have the tendency of increasing insulin resistance. Though the result of bitter lemon showed decrease concentration as the period of intake increase, such is not a guarantee of not increasing glucose level based on the insulin status and the capacity of the pancreas.

CONCLUSION
It is seen in the study that coke, sprite maltina and even bitter lemon have the tendency of causing diabetes at daily consumption.

RECOMMENDATION
Coke, sprite and maltina soft drinks must be consumed with caution to avoid the scourge of diabetes.

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