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Research Article

Dietary Intake Assessment of Sugar in Several Pack Sizes of Energy Drinks in Nigeria

Fregene Christopher*, Mahmood Sugra T, Ojji Dike and Adegboye Abimbola

Department of Medical Biochemistry and National Agency for Food and Drug Administration and Control, University of Abuja, Nigeria

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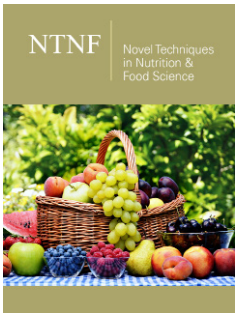

***Corresponding author:** Fregene Christopher, Department of Medical Biochemistry and National Agency for Food and Drug Administration and Control, University of Abuja, Nigeria

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Abstract

Introduction: The 2020 Global Nutrition Report shows that adult obesity and diabetes are increasing in Nigeria. Nigeria is 'off course' to meet the Global Nutrition Targets for obesity and other diet-related NCDs. The inclusion of a strategic approach to develop and implement a national strategic plan for the reduction of sugar in packaged and processed foods is key in tackling obesity among adults in Nigeria. Excessive consumption of energy drinks is believed to be a major contributing factor to obesity rise in Nigeria. World Health Organization recommends reducing the intake of free sugars to less than 10% of total energy intake, which translates to less than 50g for a 2,000kcal diet. In Nigeria, the pack size of energy drinks has increased substantially from 250ml to 500ml (indicating absence of pack size control). It is projected to increase to 750ml. This "supersizing" phenomenon is believed to be an important contributor to the increase in consumption of energy drinks. Larger (uncontrolled) pack sizes of energy drinks contain more added sugars and contribute more significantly to total dietary intake of sugar than smaller (controlled) pack sizes. Thus, controlling the pack size of energy drinks may be a highly effective sugar-intake reduction strategy. This study examines the effect of controlling pack size of energy drinks on total dietary intake of sugar in Nigeria.

Methodology: The level of sugar and pack size of energy drinks were systematically collected by this study from on-pack (nutrition) labels of (10) brands commonly available in the open markets and supermarkets in Nigeria and average daily energy drink consumption data from research studies. Assessments were done to evaluate dietary sugar intake and calculate risk associated with energy drink consumption using the recommended methods in the Codex Food Safety Risk Analysis Manual and FAO Dietary Risk-Pesticide Registration Toolkit and the WHO Population Sugar Intake Goals and Guidelines.

Result: The estimated intakes of added sugars from 500ml and 250ml packs of the energy drinks with an average sugar content of 10.27g per 100ml are 51.35g and 25.68g per day respectively. The estimated risks of exceeding the recommended maximum level of added sugars associated with 500ml and 250ml packs are 103% and 51% respectively. The estimated relative risk and risk reduction are 2 and 50% respectively. The estimated intakes of added sugars from 500ml and 250ml packs of the energy drinks with proposed maximum sugar content (benchmark) of 5g per 100ml are 25g and 12.5g per day respectively. The estimated risks of exceeding the recommended maximum level of added sugars associated with 500ml and 250ml packs when sugar content is benchmarked are 50% and 25% respectively. These results suggest that pack size, sugar content and sugar intake from energy drinks are positively associated. They also indicate that 500ml pack contributes more significantly to total dietary intake of added sugars than 250ml pack. They further suggest that benchmarking energy drink pack size at 250ml will likely contribute to a significant (50%) reduction in energy drink consumption and the risk of excessive sugar intake from energy drinks).

Conclusion and recommendation: This study concludes that sugar content and pack size control could contribute significantly to the reduction of sugar intake from energy drinks in Nigeria. It also concludes that the risk of obesity associated with excessive sugar intake from 500ml pack could be decreased if the sugar content and pack size of energy drinks are controlled. It recommends the establishment of maximum pack size and sugar content of energy drinks at 250ml and 5g per 100ml respectively.

Keywords: Dietary intake assessment; Added sugars; Energy drinks; WHO sugar guidelines; WHO African region nutrient profile model; National policy on food safety and quality.

Introduction

The 2020 Global Nutrition Report shows that adult obesity and diabetes are increasing in Nigeria. Obesity increases the risk of diabetes and other Non-Communicable Diseases (NCDs) such as hypertension, stroke and heart disease. In 2019, the prevalence of hypertension among women and men in Nigeria were projected to be 24.6% and 21.9% respectively [non-communicable disease risk factor collaboration, 2022]. Nigeria is 'off course' to meet the Global Nutrition Targets for obesity and other diet-related NCDs [GNR, 2020]. The inclusion of a strategic approach to develop and implement a national strategic plan for the reduction of sugar in packaged and processed foods is key in tackling obesity among adults in Nigeria [1]. Dietary intake assessment is crucial to development the strategic plan. Excess sugar intake increases the risk of obesity. World Health Organization recommends reducing the intake of free sugars to less than 10% of total energy intake, which translates to less than 50g for a 2,000kcal diet [2]. Studies show that the amount of sugar provided in a 500ml bottle of energy drinks in Nigeria is typically about 54g [3] and their consumption is increasing in Nigeria [Ibrahim Usman Muhammed et al., 2021] (Figure 1). Millions of coronary heart disease-related deaths are attributable to diets high in sugary drinks in Nigeria [4]. Excessive consumption of energy drinks is believed to be a major contributing factor to obesity rise in Nigeria. Manufacturers reason that if energy drinks taste good (through added sugar) and are marketed (with large pack sizes), people will drink more. In Nigeria, the pack size of energy drinks has increased substantially from 250ml to 500ml (indicating absence of pack size control). It is projected to increase to 750ml. This "supersizing" phenomenon is believed to be an important contributor to the increase in consumption of energy drinks [5]. The work by the McKinsey Global Institute revealed that portion (pack size) control, as opposed to other interventions such as weight management programs, media restrictions and food taxes, has the highest impact to reduce obesity and promote behavior change [6]. As recently as 2019, a comprehensive analysis by the OECD confirmed this and favored smaller portion (pack) sizes as a public health tool to reduce consumption of energy-dense foods [7]. The German government already adopted this strategy in its approach to tackle diabetes and obesity among children and adolescents [8]. Larger (uncontrolled) pack sizes of energy drinks contain more added sugars and contribute more significantly to total dietary intake of sugar than smaller (controlled) pack sizes. Thus, controlling the pack size of energy drinks may be a highly effective sugar-intake reduction strategy. The labelling of a 250ml can (which is considered a serving size for) of energy drinks recommends limiting intake to not more than 500ml of energy drinks in a day if the 32mg caffeine is present in 100ml of the product. It is argued that if the caffeine 22mg per 100ml, then an 800ml of energy drinks will have less overall caffeine content than the aforementioned 500ml. It is believed that this (basing the number of recommended maximum servings a day only on caffeine content) may pose a health risk with regards to excess sugar intake and obesity. This study examines the effect of controlling pack size of energy drinks on total dietary intake of sugar in Nigeria.

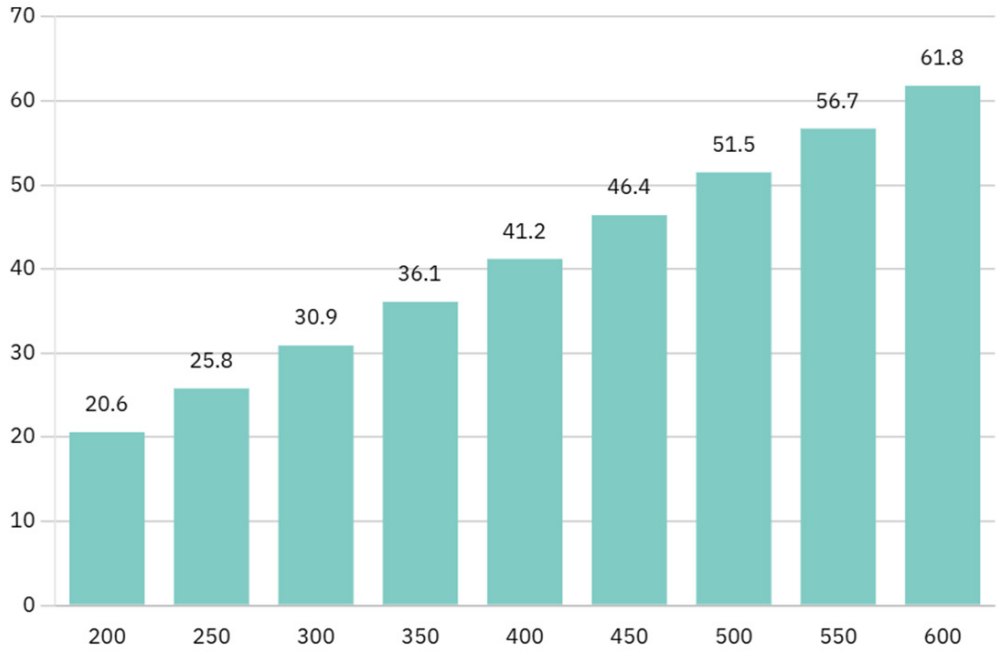

Figure 1: Average sugar intake from various pack sizes of energy drinks in Nigeria.
This chart shows that the average sugar intake from 500ml bottle exceeds the WHO recommended maximum daily sugar intake of 50g per day on a 2000kcal diet.

Methodology

Sugar content of energy drinks in Nigeria

Table 1: Typical Sugar content of energy drinks in Nigeria.

S/N	Brand Name	Sugar Content (g per 100ml)
1	Predator	13.5
2	Supa Komando	11.0
3	Fearless	9.7
4	Climax	11.0
5	Power horse	11.0
6	Bullet	11.3
7	Red bull	11
8	Monster	8.0
9	Reaktor	11.0
10	Maga	5.2
	Mean ± margin of error Confidence level, standard error of mean	10.27±1.391 95%, 1.960sx̄

Data on sugar content was estimated from on-pack nutrition labels of several brands of energy drinks most commonly available in open markets and supermarkets in Nigeria (Table 1).

Consumption of energy drinks in Nigeria

Data on consumption was estimated from the study of VO Ansa.

Estimation of mean dietary sugar intake

Using the information on sugar content and consumption level, dietary sugar intake from energy drinks was estimated according to a methodology developed by Joint Expert Committee on Food Additives (JECFA) as stated below.

Calculation:

(Mean sugar content in g per 100ml of the energy drinks x consumption of the energy drinks in ml per day)/100).

Conversion factor

1kcal = 4.18 kg

Risk characterization

The risk was characterized by comparing the estimated dietary sugar intake with and expressed as a percentage of, the WHO Population Sugar Intake Goal (Table 2).

Table 2: The nutrient profile model for the WHO African Region [WHO, 2018].

Food Category	Examples of Food Items	Codex Food Category code	Total Fat (g)	Saturated fat (g)	Total Sugars (g)	Added Sugars (g)	Sodium (g)	Energy (kcal)
Water- based flavoured and unflavoured drink	Sport, energy drinks, electrolyte drinks, carbonated and non-carbonated water-based flavoured drinks (i.e. soft drinks), powdered juices, concentrates (liquid or solid) calculated as or in ready-to-drink form, flavoured waters (sparkling), reconstituted chocolate or malted powdered drinks, syrups, sugar cane juices	14.1.4	No threshold provided	No threshold provided	0	No threshold provided	0.1	No threshold provided

NB: Marketing is prohibited if thresholds exceed values per 100ml.

Relative intake (risk)

Dietary intake (risk) when energy drinks without proposed benchmark is consumed/Dietary intake (risk) when the energy drinks with proposed benchmark is consumed.

Relative intake (risk) reduction

(Dietary intake [risk] when energy drinks without proposed benchmark is consumed-Dietary intake [risk] when the energy drinks with proposed benchmark is consumed/Dietary intake [risk] when the energy drinks without proposed benchmark is consumed) x100.

Dietary risk

Dietary risk is the estimated dietary intake expressed as a percentage of the WHO Population Sugar Intake Goal.

Result and Discussion

The estimated intakes of added sugars from 500ml and 250ml packs of the energy drinks with an average sugar content of 10.27g per 100ml are 51.35g and 25.68g per day respectively. This average content is not significantly different from the findings of Higgins et al [3]. Estimated total average sugars exceed the threshold for total sugars, which is 0g total sugar per 100ml of the product, for marketing prohibition [9]. The estimated risks of exceeding the recommended maximum level of added sugars associated with 500ml and 250ml packs are 103% and 50% respectively. This means that there is absolute certainty of exceeding the recommended maximum daily level of added sugars if 500ml of the energy drink is consumed daily. Also, it suggests that there is 50% chance of exceeding the recommended level if the 200ml of the energy drink is consumed daily. The estimated relative risk

and risk reduction are 2 and 51% respectively. This means that those who consume 500ml are two times more likely to exceed the recommended max. than those who consume 250ml pack daily. It also indicates that there is a significant (50%) reduction in the risk of exceeding the recommended max. if 250ml instead of 500ml pack is consumed. The estimated intakes of added sugars from 500ml and 250ml packs of the energy drinks with proposed maximum sugar content (benchmark) of 5g per 100ml are 25g and 12.5g per day respectively (Figure 2). This means that there is a significant reduction in intakes from both 500ml and 250ml packs when sugar content is limited. The estimated risks of exceeding the recommended maximum level of added sugars associated with 500ml and 250ml packs when sugar content is benchmarked are 50% and 25% respectively. This means that there is no longer absolute certainty of exceeding the recommended max. associated with the 500ml pack size with the introduction of the sugar content benchmark. It also indicates a significant reduction in the risk of exceeding the recommended max. from 500ml and 250ml packs when the sugar content benchmark is introduced. Overall, these results suggest that pack size, sugar content and sugar intake from energy drinks are positively associated. They also indicate that 500 ml pack contributes more significantly to total dietary intake of added sugars than 250ml pack. They further suggest that benchmarking energy drink pack size at 250ml will likely contribute to a significant (50%) reduction in energy drink consumption, the risk of excessive sugar intake and the risk of obesity from energy drinks. There is evidence that exposure to smaller pack sizes recalibrates what is perceived as "normal" and subsequently, how much beverage is selected and consumed [10]. Additional Studies have indicated that pack size control is an effective approach in tackling obesity [8-22] (Tables 3 & 4).

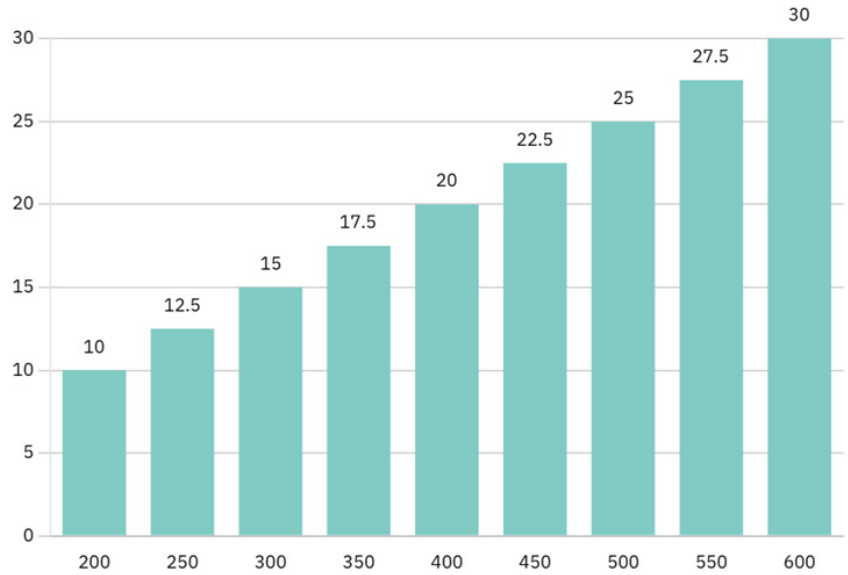

Figure 2: Maximum sugar intake from various pack sizes of energy drinks in Nigeria when the recommended maximum sugar level is implemented.
This chart shows that there is a significant reduction in sugar intake when a maximum sugar level of 5g per 100ml is implemented as a strategy for managing the risk of excess sugar intake from energy drinks. It shows that the maximum sugar intake from a 500ml bottle falls below the WHO recommended maximum daily sugar intake on a 2000kcal diet.

Table 3: Average sugar content from various pack sizes of energy drinks in Nigeria.

Pack Size (ml)	Average Sugar Content (g)	Average Sugar Intake (g per day)	Risk of Exceeding the Recommended Maximum Daily Sugar Intake – 50 G Per Day
200	20.6	20.6	0.412
250	25.8	25.8	0.516
300	30.9	30.9	0.618
350	36.1	36.1	0.722
400	41.2	41.2	0.824
450	46.4	46.4	0.928
500	51.5	51.5	1.03
550	56.7	56.7	1.134
600	61.8	61.8	1.236

NB for risk category (proposed based on the probability line concept):

0=No risk

≤0.45=Low risk

>0.45-≤0.55=medium risk

>0.55=high risk

≥1=certain

(300ml to 450ml pack daily consumption falls under high risk, which warns of the possibility of exceeding the recommended maximum and calls for risk management strategies. 500ml upward pack daily consumption falls under certain, which suggests the certainty of exceeding the recommended maximum and unacceptability).

Table 4: Maximum sugar content from various pack sizes of energy drinks in Nigeria.

Pack Size (ml)	Proposed Maximum Sugar Level (5g per 100ml)	Average Sugar Intake (g per day)	Risk of Exceeding the Recommended Maximum Daily Sugar Intake-50g per day
200	10	10	0.2
250	12.5	12.5	0.25
300	15	15	0.3
350	17.5	17.5	0.35
400	20	20	0.4
450	22.5	22.5	0.45
500	25	25	0.5
550	27.5	27.5	0.55
600	30	30	0.6

NB for risk category (proposed based on the probability line concept):

0=No risk

≤0.45=Low risk

>0.45-≤ 0.55=medium risk

>0.55=high risk

≥1=certain

(350ml to 450ml pack daily consumption falls under low risk, which indicates “unlikely” to exceed the recommended maximum. 500ml to 550ml pack daily consumption falls under medium risk, whereas 600 ml pack daily consumption falls under high risk. This indicates predicted reduction in risk through proposed sugar content regulation).

Conclusion and Recommendation

This study shows excessive sugar intake from 500ml bottle of energy drinks in Nigeria. It concludes that sugar content and pack size control could contribute significantly to the reduction of sugar intake from energy drinks in Nigeria. It suggests that the risk of obesity associated with excessive sugar intake may be decreased if the sugar content and pack size of energy drinks are controlled. It recommends the establishment of maximum pack size and sugar content of energy drinks at 250ml and 5g per 100ml respectively. This has the potential of driving energy drink reformulation to lower their sugar content.

Assumption

A. The on-pack sugar content data reflect correct analytical data.

B. Estimation of free/added sugars is based on the number of total sugars (carbohydrate) declared on product packaging. The product is a food with no or a minimal amount of naturally occurring sugars.

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