

The Effect of School Food Environment on Consumption of Sugar-Sweetened Beverages Among Adolescents in Selected Secondary Schools in Ibadan, Nigeria

Olaitan Bobade¹, Afusat Ozoh²

¹Intern Dietitian, Dietetics Department, University College Hospital, Ibadan, Oyo state, Nigeria.

²Chief Dietitian, Dietetics Department, University College Hospital, Ibadan, Oyo state, Nigeria.

Corresponding Author: Olaitan Bobade

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ABSTRACT

Background: Consumption of sugar-sweetened beverages is a behaviour commonly shared among adolescent friendship groups especially in schools, where there is a high availability of such beverages. Due to the likelihood for this dietary habit to continue into adulthood, adolescents should be targeted for interventions to decrease sugar-sweetened beverages intake. This study investigated how the school environment impacts the consumption pattern of sugar-sweetened beverages in adolescents in selected secondary schools in Ibadan, Nigeria.

Methods: A descriptive cross-sectional design was conducted among 100 adolescents from 2 secondary schools. Consumption pattern of sugar-sweetened beverages was collected via a self-administered questionnaire. Data on exposure to sugar-sweetened beverages was collected by the interviewer. Carbonated soft drinks and fruit drinks were the only sugar-sweetened beverages categories assessed. Descriptive statistics was used to analyze data with significance judged at $p < 0.05$.

Results: There was high exposure to sugar-sweetened beverages within the school food environment. Carbonated soft drink was the more frequently consumed beverage. Majority (67.1%) of the respondents consumed either of the two sugar-sweetened beverages at least 7 times in a week. However, when comparing frequency and location of consumption, both beverages were individually consumed more frequently outside school. Overall, there was no significant association between the school-food environment and sugar-sweetened beverages consumption pattern.

Conclusion: Consumption of sugar-sweetened beverages among adolescents may be associated with other environmental influences outside schools. Public health nutrition interventions to reduce consumption of sugar-sweetened beverages among adolescents should not be limited to schools alone.

Keywords: Sugar-sweetened beverages, adolescents, school food environment

INTRODUCTION

Growing up typically comes with a shift in dietary preferences and behaviours. Adolescence, however, is a critical time in the establishment of life-long eating patterns, and important environmental influences for adolescents' dietary behaviours such as availability and accessibility (i.e. physical environmental factors) may influence these

dietary patterns. [1] Sugar-sweetened beverages (SSBs) refer to a variety of beverages that contain added sugars such as fruit drinks, carbonated drinks, sports drinks, energy drinks, flavoured milk drinks, and sweetened coffees or teas. [2] These beverages have been found to be a major source of added sugars and energy in the diet of adolescents and they often give zero

nutritional value.^[2] Also, they are a causative factor for obesity and many chronic non-communicable diseases.^[3] Consumption of these SSBs is a behaviour commonly shared among adolescent friendship groups, with the strongest similarities in schools where there is a high availability of soft drinks.^[4] The school food environment comprises of the facilities on the school ground, in which food and beverages are sold or made available, as well as similar facilities within the school neighbourhood.^[2] An association has been identified between the consumption of sugar-sweetened beverages and the access to food retailers in the school neighbourhood.^[5] A 2018 study found that adolescents who purchase meals or snacks from food outlets at school (e.g. cafeterias) and off school property (e.g. fast food, restaurants, and other convenience stores close to the school) had a higher rate of consuming sugar-sweetened beverages than those who did not make such purchases.^[6]

Multiple studies have found the school food environment to be a huge predictor of the consumption pattern of sugar-sweetened beverages amongst adolescents.^[7] ^[8] In contrast, some other studies found that the school food environment had little to negligible impact on sugar-sweetened beverages consumption.^[2] ^[9] Furthermore, a study conducted in Southern Nigeria reported that 97.2% of adolescent subjects consumed at least one bottle of soft drink a day even though the presence of a soft drinks vending shop in the school did not appear to influence consumption.^[10] In Ibadan North local government area, there is limited research on the effect of the school food environment on the consumption of sugar-sweetened beverages amongst adolescents. This study sought to bridge this knowledge gap by investigating how the school food environment affects the consumption pattern of sugar-sweetened beverages among adolescents in Ibadan, Oyo state, Nigeria.

MATERIALS & METHODS

A descriptive cross-sectional design was adopted for this study. A convenient sample size of 100 was employed. The study was carried out in 2 selected 'day' secondary schools in Ibadan North local government area of Oyo state, Nigeria. The study respondents were secondary school students between the ages 10-19 years old. A multi-stage sampling technique was used

Stage one: A simple random sampling technique was used to select 2 secondary schools within the study location.

Stage two: A systematic random sampling was used to select respondents from each class in the participating secondary schools.

Ethical approval/Informed consent

Ethical clearance was obtained from the University of Ibadan/University College Hospital Ethical Committee. Informed consent was obtained from participants via consent and assent forms.

Data collection

Questionnaire

A self-administered questionnaire was used to collect data from the respondents. A well-structured questionnaire was used to collect information on the personal characteristics of the respondents. Questions from the beverage and snack questionnaire were adapted and modified to collect data on the sugar-sweetened beverage intake and consumption pattern of the respondents.^[11]

Data on the exposure of the students to sugar-sweetened beverages within and around the school premises was collected by the interviewer. Exposure to sugar-sweetened beverages within and around the school environment was defined by

1. The presence of any facility that sells SSBs inside the school and in the surrounding neighbourhood
2. The presence of structures sponsored by an SSB brand e.g. a kiosk or a building plastered with promotional wallpapers or materials for that brand

Anthropometric measurements

The anthropometric measurements of the respondents were taken following the WHO standard. Weight was measured using a portable well-calibrated digital weighing scale. Respondents were told to remove items that could over-estimate their weight before weighing. The height measurement was taken using a tape rule. Respondents were told to stand with their scapula, buttocks, and heels touching the wall with the head adjusted to be in its natural non-stretched position.

Statistical Analysis

Descriptive statistics such as percentage and frequencies were used to present the results of demographic characteristics, exposure to sugar-sweetened beverages, and frequency of sugar-sweetened beverage intake. Continuous variables of age, anthropometric measurements and average daily allowance were analyzed descriptively using mean \pm standard deviation and range. Association between frequency of intake and most probable location of consumption, perceived reasons for consumption, probable time of consumption and nutritional status was assessed using inferential statistics; Pearson chi-square analysis at 5% level of significance. Data was statistically analyzed

using the Statistical Product and Service Solutions (SPSS) windows software, version 20.0.WHO AnthroPlus was used to determine BMI-for-age of the respondents using the weight, height, and age variables.

RESULT

The frequency of consumption of sugar-sweetened beverages by the respondents in a typical week is summarized in Table 1. Considering carbonated soft drink (CSD) consumption at school, those who did not consume it were the most (31.2%), followed by those who did but for only 2 to 4 times per typical week (29.0%). On the other hand, when considering CSD intake at places besides school, those who consumed CSD once per week were the most (28.4%). In total, 23% of the respondents reported consuming CSD at least once per day in school, while 15.9% reported drinking it in places other than school at the same rate.

Considering fruit drink (FD) in school, two in every three (66.7) of the respondents did not consume it in school while those that did mostly did once per week (14.4%). The proportion was more evenly distributed when considering fruit drink consumed out of school, as only 34.1% did not consume it, while 30.7% and 19.3% took it once and 2 through 4 times per week respectively.

Table 1: Respondents' frequency of consumption of SSBs

	Frequency of consumption						
	Never	Once/week	2-4 times/week	5-6 times/week	Once/day	2-3 times/day	≥ 4 times/day
CSD at school (N = 93)	29 (31.2)*	10 (10.8)	27 (29.0)	5 (5.4)	18 (19.4)	4 (4.3)	0 (0)
CSD not at school (N = 88)	24 (27.3)	25 (28.4)	16 (18.2)	9 (10.2)	8 (9.1)	5 (5.7)	1 (1.1)
FD at school (N = 90)	60 (66.7)	13 (14.4)	4 (4.4)	1 (1.1)	11 (12.2)	1 (1.1)	0 (0)
FD not at school (N = 88)	30 (34.1)	27 (30.7)	17 (19.3)	3 (3.4)	9 (10.2)	1 (1.1)	1 (1.1)

*N (%) CSD – Carbonated Soft Drinks; FD – Fruit Drink

Respondents' exposure to sugar-sweetened beverages is shown in Table 4.2. Almost all the respondents (92%) reported that they consume carbonated soft drinks. Likewise, four in every five of the respondents (79.8%) reported their usual consumption of fruit drinks. The respondents largely considered thirst as the reason for

consuming sugar-sweetened beverages (44.6%). However, influence of classmates and parents (22.8%) and accessibility of SSBs (21.7%) were notable considerations. Also, more than two out of every three (68.7%) of the adolescents reported home as the most likely location to consumed SSB

while club is the least (1.0%) of the likely locations.

More than half of the respondents (52%) reported that they were more likely to consume sugar-sweetened beverages during lunch break. A similar proportion (54.5%)

reported that they consumed items brought from home during lunch break. By and large, 72.2% of the respondents reported their awareness of the nutritional impacts of consuming SSB.

Table 2: Respondents' Exposure to Sugar-Sweetened Beverages

		N (%)
Carbonated Soft Drinks (CSD) Consumption (N = 100)	No	8 (8.0)
	Yes	92 (92.0)
Fruit Drink (FD) Consumption (N = 99)	No	20 (20.2)
	Yes	79 (79.8)
Reasons for consuming SSB (N = 92)	Influence of parents/friends	21 (22.8)
	Accessibility	20 (21.7)
	To quench thirst	41 (44.6)
	Others	10 (10.9)
Most likely location to take SSB (N = 99)	At home	68 (68.7)
	At school	12 (12.1)
	Party	7 (7.1)
	Market	4 (4.0)
	Club	1 (1.0)
	Combination of the locations	2 (2.0)
	Others	5 (5.1)
Most likely time to take SSB (N = 98)	In the morning	13 (13.3)
	During lunch break	51 (52.0)
	After classes	13 (13.3)
	Anytime	3 (3.1)
	Anytime besides mornings	3 (3.1)
Items consumed during lunch break (N = 99)	Food/Snack brought from home	54 (54.5)
	Food/Snack bought in school	36 (36.4)
	None	8 (8.1)
	Food/Snack obtained in from both	1 (1.0)
Awareness of the nutritional impact of consuming SSB (N = 97)	No	27 (27.8)
	Yes	70 (72.2)

N (%) – Frequency (Percentage);

The frequency of total sugar-sweetened beverage consumed by the respondents is shown in Table 3. More than three out of every five of the respondents (61.3%) consumed carbonated soft drink only frequently (i.e. at least 5 times per week) while 44.6% consumed fruit drink at the same rate. Total sugar-sweetened beverage was more frequently consumed among the respondents, as 67.1% had frequent intake (of at least 7 times per week).

Table 3: Frequency of Total Sugar-Sweetened Beverage Consumption by the Respondents

	Consumption Frequency		Total
	Infrequent	Frequent	
Carbonated Soft Drink ¹	31 (38.8) *	49 (61.3)	80
Fruit Drink ¹	36 (55.4)	29 (44.6)	65
Total Sugar-Sweetened Beverage ²	25 (32.9)	51 (67.1)	76

*N (%)

¹For Carbonated Soft Drink and Fruit Drink, frequent intake = at least 5 times per week

²For Total Sugar-Sweetened Beverage, frequent intake = at least 7 times per week

Table 4 summarizes the anthropometric measurement and the anthropometric index of the respondents. The average weight of the adolescent respondents was 48.5 kilograms (SD = 9.63) while mean height was 1.59 meters (SD = 0.09). The BMI-for-Age of the respondents showed that nearly all (95.6%) the respondents were within normal BMI range. Only 4.4% were underweight while none was overweight.

Table 4: Anthropometric Measurements and Index of Respondents

N = 100		N (%)
Weight (kg)	Mean ± SD	48.50 ± 9.63
Height (m)	Mean ± SD	1.59 ± 0.09
BMI-for-Age (N = 91)	Underweight	4 (4.4)
	Normal	87 (95.6)

Table 5 shows the association between the common location of consumption of sugar-sweetened beverage and the frequency of intake. Though respondents who reported home and school as the most common

locations of consuming carbonated soft drinks were more in the frequent intake group (66.1% and 55.6% respectively) than the infrequent category (33.9% and 44.4% respectively), this is not statistically significant ($p = .272$). Likewise, fruit drink intake, which was reported to have been consumed more frequently (60.0%) than not

(40.0%) by respondents who indicated school as their probable location of consumption, was not associated with location of consumption ($p = .214$). Hence, there was no association between frequency of intake of total sugar-sweetened beverage and the most probable location of consumption.

Table 5: Association Between Common Location of Consumption and Frequency of Sugar-Sweetened Beverage Intake

	Common location of consumption	Frequency of Consumption		P-value*
		Infrequent	Frequent	
CSD Intake (N = 77)	Home	19 (33.9)	37 (66.1)	.272
	School	4 (44.4)	5 (55.6)	
	Other places besides home/school	7 (58.3)	5 (41.7)	
Fruit Drink Intake (N = 62)	Home	23 (52.3)	21 (47.7)	.214
	School	2 (40.0)	3 (60.0)	
	Other places besides home/school	10 (76.9)	3 (23.1)	
Total SSB Intake (N = 73)	Home	17 (33.3)	34 (66.7)	.493
	School	2 (22.2)	7 (77.8)	
	Other places besides home/school	6 (42.6)	7 (42.6)	

CSD – Carbonated Soft Drink; SSB – Sugar-Sweetened Beverage

* χ^2 , P-value < 0.05

Relationship between frequency of consumption of sugar-sweetened beverage intake and the perceived reasons of consuming it is summarized by Table 6. There was no relationship found between carbonated soft drink intake frequency and perceived reasons for consuming it by the respondents ($p = .298$). However, there was a relationship between frequency of consumption of fruit drink and perceived reasons ($p = .009$), as respondents who considered accessibility as the main reason

for consuming fruit drink were significantly more in the frequent category (83.3%) than infrequent category (16.7%), while influence of friends/parents, quenching thirst and other reasons had significantly higher respondents in the infrequent groups (53.6%, 67.9% and 85.7% respectively) than the frequent group.

Overall, total sugar-sweetened beverage intake frequency was not associated with perceived reason for consumption among the respondents ($p = .324$)

Table 6: Association Between Perceived Reasons and Frequency of Sugar-Sweetened Beverage Intake

	Perceived Reasons	Frequency of Consumption		P-value*
		Infrequent	Frequent	
CSD Intake (N = 74)	Influence of mates/friends/parents	11 (57.9)	8 (42.1)	.298
	Accessibility	6 (40.0)	9 (60.0)	
	To quench thirst	11 (34.4)	21 (65.6)	
	Other reasons	2 (25.0)	6 (75.0)	
Fruit Drink Intake (N = 60)	Influence of mates/friends/parents	7 (53.6)	6 (46.4)	.009
	Accessibility	2 (16.7)	10 (83.3)	
	To quench thirst	19 (67.9)	9 (32.1)	
	Other reasons	6 (85.7)	1 (14.3)	
Total SSB Intake (N = 71)	Influence of mates/friends/parents	9 (45.0)	11 (55.0)	.324
	Accessibility	2 (15.4)	11 (84.6)	
	To quench thirst	11 (36.7)	19 (63.3)	
	Other reasons	2 (25.0)	6 (75.0)	

CSD – Carbonated Soft Drink; SSB – Sugar-Sweetened Beverage

* χ^2 , P-value < 0.05. Bold P-value indicates statistical significance

DISCUSSION

In this study, the prevalence of those who consumed carbonated soft drinks was higher than that of fruit drinks, corresponding with the findings of Godin *et*

al., who reported that soft drinks was the SSB category consumed most frequently among adolescents. [2] This is likely due to the fact that carbonated beverages constitute the major part of the worldwide soft drinks

industry and they are often advertised in a way that is attractive to younger customers. [12] This disparity between the prevalence of both SSB types could also be due to the higher selling price of fruit drinks as compared to carbonated soft drinks. Interestingly, this study found that the most frequent consumption of sugar-sweetened beverages was in the 30.7% of respondents who consumed fruit drinks outside of school once a week. This may be due to a perception that fruit drinks are good for the health whereas they contain added sugars in high amounts which is detrimental to the health.

Quenching thirst was the most common reason for which most of the respondents consumed SSBs. This result is in line with a previous study where majority of respondents reported that they consume sugar-sweetened beverages because of its good taste and how refreshing it is. [13] The influence of parents was also evident in this study as it was the second most common reason why adolescents in this study reported they consume sugar-sweetened beverages. This is probably because parents serve as role models and facilitators in impacting children's diets. [14]

In this study, the presence of SSBs in the schools was primarily through products being sold. The two schools used in this study had at least two tuck shops where sugar-sweetened beverages were readily accessible. Neither of the schools displayed advertisement or promotional materials of SSBs and none of the kiosks or tuck shops were sponsored by the SSB industry. Additionally, both schools ran a closed-campus policy which means that students were unable to leave the school premises during lunch breaks. This implies that the respondents' exposure to sugar-sweetened beverages in the school environment was restricted to those available within the school. Considering this accessibility and availability in both schools, it is clear that the school food environment favored the exposure of the adolescents to sugar-sweetened beverages.

However, despite this exposure within the school premises, less than one-fifth of the respondents reported school as the location they were more likely to consume sugar-sweetened beverages. This result is corroborated by that of Ansa *et al.*, who reported that Nigerian adolescents who attended schools without a vending shop that sold soft drinks consumed at least one bottle of soft drink per day more than those in schools with a vending shop. [10] Conversely, Angie *et al.*, reported that teenage students whose schools had stores that sold high calorie, low nutrient beverages and purchased them reported one-third of a serving higher intake of sugar-sweetened beverages than those attending a school without a store selling such items on a particular day. [8] In fact, majority of the respondents reported that they were more likely to consume sugar-sweetened beverages at home, consistent with that of a previous study. [15] The high consumption of sugar-sweetened beverages at home could be due to lack of parental rules that limit the consumption of SSBs especially seeing as this present study found that more than half of frequent SSBs drinkers did so due to influence of third-parties, parents being one of them. Furthermore, parents/guardians are often responsible for purchasing and preparing foods, giving them considerable control over what foods/beverages are available at home. [2]

This study found no association between the frequency of consumption of sugar-sweetened beverages and the most probable location of consumption. Additionally, when considering the association between the perceived reason for consuming carbonated soft drinks and the frequency of doing so, this study found no relationship. For fruit drinks, on the other hand, there was a relationship between frequency of consumption and perceived reasons for consumption. The respondents who considered accessibility as their main reason for consuming fruit drinks were significantly more in the frequent category than infrequent category. This is notable

considering the fact that many of the respondents stated that they were more likely to consume fruit drinks outside of school. This could be the case because as stated earlier, fruit drinks typically have a higher selling price than carbonated soft drinks, and so, it will likely be more accessible outside of school where someone else, possibly a parent or guardian may be responsible for making the purchase. Furthermore, because of the higher selling price of fruit drinks, SSBs retailers in the schools had more carbonated soft drinks for sale, than they did fruit drinks.

Overall, this study found no significant association between the school-food environment and SSB consumption in the adolescents. Similar findings have also been reported in other studies. [9] [16] The ubiquity of these SSBs could explain this finding as adolescents have countless ways to obtain SSBs through supermarkets, stores, fast-food restaurants, and other food outlets in their community. Also, SSBs are usually heavily advertised, marketed and particularly targeted towards the adolescence age group. [17]

In adolescents, the high intake of SSBs has been consistently linked to overweight and obesity. [18] In this study, though, the BMI-for-Age of the respondents showed that despite high consumption of SSBs, nearly all the respondents were within normal body mass index (BMI) range. This aligns with a previous study conducted amongst Nigerian adolescents where the prevalence rates of obesity and overweight were low and the quantity of soft drinks consumed was found to have no significant effect on this prevalence. [10] In contrast, Mâsse *et al.*, found that access to SSBs at school and their consumption were both associated with obesity in adolescents. [19] Although physical activity was unaccounted for in this present study, the absence of overweight or obese respondents may be attributed to the high physical activity level that is typically present in the adolescence population. Various studies conducted amongst Nigerian adolescents have reported

their physical activity level to be between moderate and high on most days of the week. [10] [20]

Majority of the respondents of this study reported that they were aware of the nutritional impacts of consuming SSBs. This tallies with the findings of another study where the consumption of sugar-sweetened beverages was high among adolescent students despite moderate level of nutritional knowledge by most of them. [21] This depicts a need to not only conduct nutrition education on the detrimental impacts of sugar-sweetened beverages but to also back it up by restricting and limiting access to these beverages.

The findings of this study is important because it illustrates the fact that environmental influences are more of risk predictors, than they are causative factors for individuals' dietary behaviors. This present study, however, has some limitations. First, the study did not make use of a large pool of respondents. Secondly, it is important to note that this study assessed the intake of sugar-sweetened beverages over a week which may have given rise to respondent burden and recall bias. Lastly, this study did not comprehensively examine all the categories of sugar-sweetened beverages consumed in the study location.

CONCLUSION

There was a high exposure to sugar-sweetened beverages in the school food environments assessed in this study, and a corresponding frequent SSBs consumption amongst the respondents. However, there was no significant association between the exposure to SSBs in the school food environment and SSB consumption pattern. Hence, public health nutrition policies and interventions to reduce consumption of SSBs and promote healthy dietary patterns amongst adolescents should be implemented not only in school, but also in other settings - at home, and in the community.

Furthermore, the consumption of healthy alternatives such as water, unsweetened dairy products, 100% fruit and

vegetable juices and smoothies should be widely encouraged through nutrition education to both adolescents and their parents.

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