

Knowledge, Practice and Perception of Taking Soft Drinks with Food and the Metabolic Effects on High School Students in Ghana

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Abstract

Introduction: Soft drinks are non-alcoholic beverages that contain carbon dioxide, nutritive or non-nutritive sweeteners, natural or synthetic flavours, colours, acidification agents, chemical preservatives and emulsifiers in addition to other various functional agents. Studies in adolescents has revealed that soft drink consumption is too high in adolescents which has been associated with higher risk of becoming overweight and increased risk for diabetes, cardiovascular diseases and some cancers. This study sought to assess the knowledge, practice and perception of taking soft drinks with food among Junior High School (JHS) students in a municipality in Ghana.

Materials and methods: The design was a cross sectional studies involving 273 students in Junior High Schools in Ghana. WHO's Step-wise questionnaire was modified to gather all data.

Results: About 1 out of every 4 students (22.2%) had no knowledge that carbohydrate/sugar was a nutrient in soft drinks. About 58.4% of the students were aware of health implications of taking soft drinks with food and about 46.5% of them mentioned an increase in body weight as an implication of taking soft drinks. About 30.3% of the students were undernourished, 51.0% were of normal weight, while 12.4% of were overweight and 6.2% were obese. This knowledge in nutrition had little changes on their BMI. There was no significant difference between BMI and the number of times soft drinks was taken with food (p -value=0.808). On the average JHS students take soft drinks with food at least once in a week. They perceived the practice not to be a healthy one and they thought people practice it because it is nice.

Conclusion: Majority of the students had some knowledge of the effects on health of the practice of consuming soft drinks with food. However, they had little knowledge on the nutrients contained in the soft drinks.

Most of them also knew the nutritional implications of taking soft drinks with food but it did not deter them from practicing it.

Keywords: Soft-drink; Perception; Practice

Introduction

Soft drinks are non-alcoholic beverages that contain carbon dioxide, nutritive or non-nutritive sweeteners, natural or synthetic flavours, colours, acidification agents, chemical preservatives and emulsifiers in addition to other various functional agents [1]. Soft drinks are formulated to provide an assimilated energy booster to the consumer and generally contain soluble sugars, which are easy to administer [1]. Ashrust [1] also mentions that soft drinks are an essential source of hydration since they are more readily absorbed than water and hence can replace salt and energy quickly and are rapid thirst quenching. According to Heshmat [2], the per capita soft drink consumption has increased almost 500% over the past 50 years. A third of teenagers drink at least three cans of soda a day and on the average adolescents get about 11% of their calories from soft drinks which corresponds to about 15 teaspoons of sugar [3].

A healthy diet during childhood and adolescents promotes optimal health, growth and cognitive development of the child, adolescents and may contribute to the prevention of chronic diseases in later life [4]. Evidence however suggests that eating habits adopted early in life tracks back to some extent into adulthood while the transition from childhood to adolescence is often associated with unhealthy dietary changes. It therefore becomes necessary to establish healthful eating behaviours early in life [4]. The evidence linking soft drinks consumption to overweight and obesity is now strong [5]. Study in adolescents has revealed that soft drink consumption is too high in an adolescent who has been associated with higher risk of becoming overweight and increased risk for diabetes, hypertension, cancer and cardiovascular diseases [6]. It therefore becomes important for

children and adolescents to develop healthy eating practices [7].

Soft drinks are a rich source of sugar and energy, with one regular can containing 10 teaspoons of sugar and 640 KJ (150 cal). But, other than sugar and fluid, they provide no other nutritional value - only 'empty' calories[8] and one that should be consumed only occasionally and in small amounts [9,10]. Some companies also use artificial sweeteners in place of the sugars for diet reasons. These artificial sweeteners include; saccharin, aspartame, acesulfame K, cyclamate and sucralose [11].

In unfortified soft drinks the only vitamins likely to be found are vitamin C and vitamin A precursor. Soft drinks contain sodium mostly from water and added sodium salts, e.g. benzoate, saccharin, citrate and CMC. Calcium and magnesium from water could also be present. Fortification with minerals is easily achieved but excesses can give rise to salty or astringent notes, metallic taints and laxative effects [1].

Acidulants are an essential part of a beverage formulation. They usually perform a variety of functions in addition to their primary role of thirst quenching which comes about as a result of stimulation of the flow of saliva in the mouth. The acid content of soft drinks is the third in order of concentration. Acidulants reduce pH and can therefore act as a mild preservative and as flavour enhancers depending on the other components present. In addition they function as a synergist to antioxidants such as butylated hydroxyl anisole (BHA), butylated hydroxyl toluene (BHT) and ascorbic acid and also indirectly prevent discolouration and rancidity. Citric acid is the most widely used acid in fruit-flavoured beverages and has a light fruity character that blends well with most fruit flavours and occurs naturally in many fruit types. Other acidulants used include phosphoric acid, tartaric acid, lactic acid, acetic acid, malic acid, fumaric acid and ascorbic acid. The flavour of the drink provides its generic identity and also its unique character. This sensory characteristic is what attracts and satisfies customers. Flavouring consists of a mixture of aromatic substances carefully balanced to convey the right message to the sensory receptors of the consumer [1].

Literature suggests that changes in soft drink consumption as small as one serving per day can lead to significant increase in weight over time [12]. According to Ludwig et al. [13] there is no clear evidence that consumption of sugar per se causes obesity or affects food intake in a unique manner. However research suggests that compensation at subsequent meals for energy consumed in the form of a liquid could be less complete than for energy consumed in the form of solid food. An examined 7-day food diaries of 323 adults found that energy from drinks added to total energy intake and did not displace energy ingested in other forms, Showed that total energy consumption among 16 patients was greater on the day that an energy-containing drink was given at lunch than on the preceding day [13]. Fletcher et al. [12] also suggest that the increase in obesity rates has resulted largely because of an increase in calories consumed as opposed to a decrease in calories expended.

Studies have reported a small but statistically significant negative association between soft drink consumption and bone mineral density, whereas 2 others did not (average $r=-0.03$). An association was also reported between soft drink consumption and increased risk of bone fracture (average $r=0.06$) [14].

Consumption of acidic foods such as soft drinks in children is however thought to be the major cause of dental erosion in children [15]. Although some studies believe there is insufficient evidence to directly implicate soft drinks, at present there is an overwhelming body of evidence demonstrating a causal relationship between acidic drink consumption and dental erosion. Ward [5] also adds that soft drinks damage the teeth in two ways: thus through their added acidity, they erode the surface of the enamel and lead to cavities or the sugars are metabolized by microorganisms in the mouth leading to cavities.

Soft drinks are the second biggest contributor to caffeine intake which is often cited as the most widely consumed psychoactive drug after coffee in the United States. Specifically, the psychoactive properties of caffeine have spawned extensive research that demonstrates that caffeine can be both beneficial and detrimental to individuals. Caffeine has shown positive effects on reaction time acute alertness and mood however, caffeine has detrimental effects on insulin resistance, glucose metabolism, sleep quantity and quality [5]. Caffeine has addiction potential that predisposes users, especially those who consume high amounts, to suffer from withdrawal, syndromes [5]. Adverse health effects of caffeine are even more apparent in sensitive populations, such as children and adolescents making it more complicated. When caffeine is consumed in the form of sugar-sweetened beverages, like soft drinks, there are even more negative health outcomes [5]. In the adolescent population, soft drinks account for 62.9% of caffeine intake [5]. Researchers found that the amount of soft drinks consumed had increased nearly fivefold. Specifically, French et al. [16] found that soft drink consumption among adolescents has increased 51% since 1978.

Children whose parents regularly drink soft drinks are more likely to consume soft drinks than children whose parents do not consume soft drinks regularly [17]. Restrictive parenting practices and parental involvement have been found to be associated with less soft drink consumption [18]. Environmental factors associated with increased intake are the availability of soft drinks, especially in the home [3,19] portion size including the small price differential for larger and small sizes and the level of exposure to marketing [10].

The benefits of reducing soft drink consumption include reduced overweight and obesity, reduced risk of some chronic diseases, reduced intake of caffeine and improved dental health. Behaviour change options include the replacement of soft drinks with water, replacement of soft drinks with artificially sweetened drinks and the reduction of the frequency and quantity of consumption [10]. This study therefore sought to assess the Knowledge, practice and

perception of taking soft drinks with food among Junior High School students in Tema, Ghana.

Materials and Methods

The study was a cross-sectional involving student in private Junior High Schools in Ghana.

The sample size was determined on a confidence level of 95% ($z=1.96$) and an error margin of 0.05 [20]. The sample size obtained was 264 but was rounded up to 400. However 273 students were obtained since one school declined and students also declined to participate in the study. Students were selected randomly from each of the selected school to join the study after informed consent forms were signed. The weight of the participants was weighed using the weighing scales and the height was measured using stadiometer. A WHO step-wise questionnaire was modified to collect all information including their knowledge, perception of on the consumption of soft drinks.

Data analysis

The data collected were entered and analysed using statistical package for the social science (SPSS) version 16.0. Graphs and charts were done using Microsoft excel. Frequencies and percentages were computed for categorical variables. Pearson Chi square analysis was used to test for association between BMI and other variables of interest.

Results

Background information of students indicated that 141 of the students (51.6%) were females' while 132 of the students (48.4%) (Table 1). The students were between the ages of 10 to 14 years of ages form 2 and form. Table 2 depicts some knowledge concerning consumption of soft drinks. Table 3 indicates number of consumptions per week. Almost half (44.6%) of the students thought the consumption of soft drinks with food was not a healthy practice (Table 4), whereas Table 5 shows the BMI of the students for different age groups. Table 6 shows BMI classifications of the student's BMI based on their sex and the number of nutrients mentioned. Table 7 shows the association between BMI of students and students who correctly mentioned correct implications. Table 8 shows the association between BMI and number of times soft drink was taken.

Table 1 Background information of students, sex distribution of participants.

Variables	n (%)
Gender	
Males	141 (51.6)
Females	132(48.4%)
Age Categories (yrs)	

10-12	84(30.8)
13-14	171(62.5)
15-16	18(6.7)
Level of education	
Form 1	103(37.6)
Form 2	99(36.2)
Form 3	71(26.2)
Nationality	
Ghanaians	260(95.2)
Others	13(4.8)

Table 2 Knowledge of students on the consumption of soft drinks with food.

Variable	n (%)
Knowledgeable about soft drinks	
Yes	232(86.1)
No	41(13.9)
Nutrients stated by students	
carbohydrate	42(22.2)
Vitamins	109(58.0)
Sodium	15(8.0)
Number of nutrients mentioned	
None	45(23.9)
One	121(64.4)
Two	21(11.2)
Three	1(0.5)
Implications of taking soft drinks	
Yes	159(58.4)
No	50(18.2)
Don't know	64(23.4)
Sources of information on soft drinks	
Hospital	33(12.2)
School	66(24.0)
Friends	54(19.6)
Newspaper	17(6.3)
Television	60(22.1)
First time	10(3.7)
Other	33(12.1)
Implications of taking soft drinks	
Weight loss	13(4.8)
Weight gain	127(46.5)
Obesity	126(46.1)

Height gain	11(4.0)
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Table 3 Frequency of soft drink consumption per week.

Variable	n(%)
Number of times of consumption/week	
0 times	45(16.8)
1-2 times	154(56.4)
3-4 times	55(20.0)
5-6 times	7(2.4)
7-8 times	10(3.6)
9 and above	2(0.8)

Table 4 Practice and perception on consumption of soft drinks with food.

Variable	n (%)
Reasons why student think intake of soft drinks with food is healthy practice	
Provides nutrients	38(14.3)
Improves taste	52(19.0)
Gives energy	14(4.8)
Has health benefits	79(28.6)
It is good	14(4.8)
Helps to gain weight	38(14.3)
Helps digestion	38(14.2)
Reasons why students encourage the intake of soft drinks with food	
It makes eating fun	46(17.9)
Help with digestion	20(7.1)
Can be used in place of water	55(19.7)
Tastes good	20(7.1)
Provides nutrients	87(32.1)
Because I practice it	20(7.1)
It is healthy	25(9.0)
Reasons why students would not encourage the intake of soft drinks with food	
Not healthy	122(44.6)
Affects digestion	18(6.5)
Causes obesity	44(16.1)
Causes disease	80(29.2)
Not a balanced diet	5(1.8)
Affects taste of the food	2(0.6)
Washes away nutrients	2(0.6)

Helps maintain weight	2(0.6)
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Table 5 Classification of BMI according to age groups.

Age of participants							P-value
10-12		13-14		15-16			
	n	%	n	%	n	%	
Underweight	26	36.1	40	13.7	2	16.7	0.593
Normal	32	44.4	64	50.8	7	58.3	
Overweight	9	12.5	16	12.7	1	8.3	
Obese	5	6.9	6	4.8	2	16.7	

Table 6 Classification of BMI based on sex of the students and number of nutrients mentioned.

BMI Classifications										
		Underweight		Normal		Overweight		Obese		P-value
		n	%	n	%	n	%	n	%	
Sex	Female	32	24.6	67	51.5	20	15.4	11	8.5	0.065
	Male	41	36.9	56	50.5	10	9.0	4	3.6	
Knowledge	Mentioned none	13	32.5	20	50.0	4	10.0	3	7.5	0.951
	Mentioned one	31	28.7	57	52.8	13	12	7	6.5	
	Mentioned two	3	14.3	10	47.6	1	6.7	1	6.7	

Table 7 Association between BMI and mentioned implications.

BMI Classifications										
		Underweight		Normal		Overweight		Obese		P-value
		n	%	n	%	n	%	n	%	
Mentioned none		17	29.8	33	57.9	4	7.0	3	5.3	0.154
Mentioned one		44	31.0	73	51.4	15	10.6	10	7.9	
Mentioned two		10	26.3	16	42.1	10	26.3	2	5.3	

Table 8 Association between BMI and number of times soft drink was taken with food.

BMI Classifications										
		Underweight		Normal		Overweight		Obese		P-value
		n	%	n	%	n	%	n	%	
0		7	18.9	22	59.5	4	10.8	4	10.8	0.808
1 to 2		41	33.3	57	46.3	18	14.6	7	5.7	
3 to 4		12	27.3	25	56.8	5	11.4	2	4.5	
5 to 6		3	50	2	33.3	0	0	1	16.7	
7 to 8		3	33.3	4	44.4	2	22.2	0	0	
9 and above		1	50	1	50	0	0	0	0	

Discussion

From the results (**Table 2**), 22.2% of the students were able to mention carbohydrate/sugar as a nutrient in soft drinks. This indicates that majority of the students (78.8%) had no knowledge that carbohydrate/ sugar was a nutrient in soft drinks. Although it is well known that soft drinks contain sugar, majority of the students were not able to mention it as a nutrient. This might be due to the fact that the students have little knowledge of nutrients in food. Triches and Giugliani [21] state that children show limited knowledge in nutrition. On the other hand more than half (58.0%) of the students were able to point out that vitamins is a nutrient in soft drinks and the most common vitamin some mentioned was vitamin C. However 8% of the students were aware that sodium is a nutrient. This is however contradictory as 86.1% of the students indicated that they knew something about soft drinks. This could be due to the fact that the children are more concerned about the taste of the soft drinks and are therefore not concerned about the nutritional facts on the label of soft drinks and the nutritional value it contains. May and Waterhouse [15] throw more light on it by saying that an individual's liking for a sensory attribute in a particular food often determines the individuals food choice. This becomes more evident in **Table 2** as only one person (0.5%) was able to mention all three nutrients whiles 23.9% could not mention any nutrient at all. This therefore gives a clear indication that children are not much concerned about the nutritional value of their food especially soft drinks and might be consuming it just because of the sweet taste.

Although 3.7% of the students said this was their first time learning about taking soft drinks with food, most (24%) of them said they learnt it from school and 22.1% of them said they learnt about it from television/advertisement. This however implies that any intervention for students could be targeted at the school environment since students learn a lot at school than from other places [22]. The television/radio could also be used to target children as children spend more time watching television. May and Waterhouse [15] mention that older children understood the persuasive intent of advertising and might try a drink if they saw its advertisement several times. Peer counseling could also be targeted since 19.6% indicated that they learnt it from friends. And studies unearth the fact that children learn consciously and subconsciously from friends [15]. This finding corroborate the findings of [22] in that any change needed in the knowledge of practices of JHS students should be directed to schools, peer education and the media especially the electronic ones such as audiovisuals. Majority (46.5%) of the students were able to mention an increase in weight and obesity as an implication of taking soft drinks with food. About 58.4% of the students said there were health implications of taking soft drinks with food. It can be said that majority of the students knew about the implications of taking soft drinks with food, Participation of students on the consumption of soft drinks with food.

When asked how many times they practiced it majority (56.4%) of the students indicated that they took it at least 1 to 2 times a week including some of the students who indicated

that they didn't take soft drinks with food (**Table 3**). Less number of students said the decision to take soft drinks with food came from friends (19.6%) and school (24.0%). This however affirms existing beliefs that friends and family are an important influence on choices of food subconsciously and hence children do not realize how much they are influenced [15].

Almost half (44.6%) of the students thought the consumption of soft drinks with food was not a healthy practice (**Table 4**). Some of the reasons they thought made people do it include the fact that it's nice to practice it, they enjoy the taste and it's a way of having fun. This however affirms [23] suggestion that peoples liking for a sensory attribute in a particular food is often the determining factor of food choice. Some thought it makes them more satisfied and helps to quench thirst when eating however others thought people who do that just do it to show that they are rich and can afford to buy anything that they want and others copy from friends blindly. It was surprising to know that some subjects thought soft drinks with food helped in digestion and so it was a healthy practice. Some students thought they are addicted to it. Those who thought it was a healthy practice thought it provided some needed nutrients for the body.

It was determined that there was no significant difference between the BMI of the different age groups (p -value=0.593). James and Kerr [22] explain that the association between obesity and soft drink intake occurs across all ages. There was also no statistical significance between the BMI of both sexes (p -value=0.065). Soft drinks, including sugar-sweetened and low-calorie drinks intakes have increased in all age groups and among both males and females, accounting for the largest proportion of total fluid consumption in all of the age groups for both boys and girls [24]. There was also no significant difference between those who mentioned none, mentioned one and mentioned two of the nutrients in soft drinks (p -value=0.951). It was also noticed that there was no statistical difference between those who mentioned the correct implication from those who could not mention at a p -value of 0.154. Triches and Giugliani [21] indicate that knowledge alone doesn't seem to be enough to change eating habits sufficiently. It also mentions that the level of knowledge in nutrition is greater among obese children since they might be interested or more likely to receive information on this subject than their classmates due to their condition. This knowledge in nutrition had little changes on their BMI. There was no significant difference between BMI and the number of times soft drinks was taken with food (p -value=0.808). This result is however different from other researches since French et al. [16] indicates that a serving size of soft drink per day increased the risk of becoming overweight by 60% during the course of 1 year. On the other hand it has been concluded from many epidemiological studies that intake of carbohydrate or even sucrose bears no relation with body adiposity, or the relation may be a negative one [13]. This therefore confirms the results from this study which also indicates a negative relation between BMI and the number of times soft drink was taken. Ludwig et al. [13] explains by saying that children and adults who ingest large amounts of carbohydrate, sucrose, or both

are leaner than their peers. The high intake of carbohydrate in some respondents might however reflect high levels of physical activity [13].

Conclusion

It can be concluded from this study that majority of the students had some knowledge on the consumption of soft drinks with food. However they had little knowledge on the nutrients contained in soft drinks. Majority of them also knew the nutritional implications of taking soft drinks with food. It could also be said that on the average JHS students take soft drinks with food at least once in a week. They also perceived the practice not to be a healthy one and they thought people practice it because it is nice but they would however not encourage the practice. Though not exhaustive the results of this study provide useful information for further research.

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