CVD Prevention and Control (2008) 3, 191—196

WORLD HEART FEDERATION®

www.elsevier.com/locate/precon

Soft drink consumption and overweight/obesity among Nigerian adolescents

Victor O. Ansa [a,*], Maxwell U. Anah [b], Wilfred O. Ndifon [c]

[a] *Department of Medicine, University of Calabar, PMB 1115, Calabar, CRS, Nigeria*
[b] *Department of Paediatrics, University of Calabar, PMB 1115, Calabar, CRS, Nigeria*
[c] *Department of Community Medicine, University of Calabar, PMB 1115, Calabar, CRS, Nigeria*

Received 1 October 2007; revised 21 July 2008; accepted 27 August 2008
Available online 21 October 2008

KEYWORDS
Soft drinks;
Overweight;
Adolescents;
Nigeria

Summary
Background: Over consumption of soft drinks is becoming noticeable in Nigeria especially among adolescents. This study is aimed at assessing the magnitude of soft drink consumption in a cross section of adolescents in Nigeria and determining its association with obesity and overweight.
Methods: The subjects comprised one thousand (1000) secondary school students aged 10—20 years selected by stratified random sampling from two schools.

A self administered questionnaire was used to obtain demographic data as well as data on the amount and frequency of consumption of soft drinks per day, physical activity and time spent watching television a day.

Anthropometric measurements of each subject were taken using standard methods and body mass index was calculated using International Obesity Task Force criteria.
Results: Nearly all (97.2%) subjects consumed at least one bottle (350 ml) of soft drink a day. No significant difference in the average daily consumption was found between male and female subjects. The prevalence rates of obesity and overweight were 1.7% and 6.8%, respectively. However, no statistically significant association was found between the amount of soft drinks consumed and obesity/overweight.

The presence of a soft drinks vending shop in the school did not influence consumption.
Conclusion: Soft drink consumption is on the increase in Nigeria. A clear association could not be demonstrated between soft drink consumption and obesity/overweight in this study. Health education programmes targeted at adolescents and their parents are advocated. Policies that regulate the advertisement of soft drinks and encourage physical activity should be formulated and implemented.

* Corresponding author. Tel.: +234 8023573492.
E-mail address: vic_ansa@yahoo.com (V.O. Ansa).

1875-4570/$ - see front matter © 2008 World Heart Federation. Published by Elsevier Ltd. All rights reserved.
doi:10.1016/j.cvdpc.2008.08.003

Introduction

There have been concerns regarding consumption of soft drinks in schools particularly in America and other western countries [1]. Potential health problems associated with a high intake of soft drinks are overweight, obesity, displacement of consumption of milk and dental caries [2,3].

Milk consumption decreases as soft drinks become a favourite choice for children and adolescents. Since milk is the principal source of dietary calcium, deficiency occurs. The result is a reduction in the peak bone mass in adolescence, a critical time in life. This deficit in critical bone mass results in a greater life time prevalence of osteoporosis, fracture, dental caries and erosion of enamel [3,4].

Overweight and obesity occur because children and adolescents do not reduce the quantity of food they eat at meals for the calories they consume in soft drinks. The more soft drinks they consume the greater their caloric intake and the greater the weight gain. Intake of soft drinks thus represents energy added to that from other dietary sources. Consumers of soft drinks have a higher daily caloric intake than non-consumers [5].

Health consequences of obesity include high blood pressure, hyperlipidaemia, type 2 diabetes mellitus, coronary plaque formation, recurrent chest infection and psychological problems which include poor body image [6].

The rapidly increasing obesity in young people is a major global health concern not only because of its immediate health consequences but also because of the greater risk of obesity persisting into adulthood. Annually in the United States, obesity related diseases in children and adults account for more than 300,000 deaths and more than $100 billion per year in treatment costs [7,8]

Obesity hitherto thought to be rare in resource poor counties is being increasingly recognised as an evolving health problem in Nigeria. In one study, [9], a prevalence of 2—3% was found in children 6—12 years old and 3—4% in those 13—18 years old. That study however demonstrated no clear predisposing factors. Studies done on obesity in Nigerian adolescents are rare, thus there is little data available on the subject.

Since treatment of adult obesity is difficult, the assumption is that the condition should be easier to prevent than to treat. Early detection and identification of obesity in adolescents is of critical importance in order to arrest the long term consequences and to protect adolescents against the risk of cardiovascular diseases.

Generally parents and school authorities are uninformed about the potential risk to the health of the children that may be associated with unrestricted consumption of soft drinks. Though no studies are available indicating a causal relationship, the aggressive advertisement by soft drink companies and establishment of vending shops in schools in Nigeria has resulted in noticeable over consumption of these products. This study is therefore aimed at assessing the magnitude of this problem in Nigeria with a view to initiating suitable interventional strategies.

Subjects and methods

One thousand (1000) secondary school students attending two randomly selected day schools in Calabar Municipality, Nigeria formed subjects for the study. One of the schools had a soft drink vending shop. Subjects were selected by stratified random sampling. Each school has six classes with each representing a grade. Each class (grade) has several streams where students in the same class (grade) are assigned in groups of 35 to 45 to separate classrooms usually represented by letters A, B, C and so on, depending on the total number of students in that class (grade). Streams per class (grade) were randomly selected. Twenty subjects were randomly selected from the streams chosen earlier from each class (grade), ensuring gender near equality. They comprised 499 females and 501 males aged 10 to 20 years. Ages were those of the last birthday and corresponded to school records.

Each subject completed a self administered questionnaire enquiring about the following: age, sex, amount of regular/non-diet soft drinks consumed per day, involvement in physical activity and number of hours spent watching television a day.

Body mass index and overweight/obesity cut-offs

The height of each subject was measured using a wall mounted scale without shoes while the weight was measured with a bathroom scale, the subjects wearing minimal clothing without shoes. The scale was recalibrated after each measurement.

Body Mass Index (BMI) was calculated using the formula:

$$\text{BMI} = \text{weight}\,(\text{kg})/\text{height}\,(\text{m}^2).$$

Overweight and obesity were defined using cut-off points for BMI for age and sex recommended by the International Obesity Task Force (IOTF) —

childhood obesity working group [10]. Here adult cut-offs for obesity BMI $\geqslant$ 30 kg/m^2 and overweight 25 kg/m^2 to less than 30 kg/m^2 were extrapolated to children's percentiles of BMI values from six different surveys.

Measures of physical activity and hours spent watching television

Subjects self reported the frequency and duration of physical activity they engaged in daily. Physical activity for adolescents in this environment typically include walking to school, informal outdoor games like football, fetching water for domestic use and running errands on foot or bicycle. Subjects, who engaged in at least 60 minutes of physical activity a day for at least three days in a week, were considered physically active.

This is in conformity with the current recommendations for the assessment of physical activity in youth [12].

Subjects also self reported the total time spent watching television in a day. Television viewing of at least two hours a day was considered an indicator of low physical activity.

Calculation of calories in soft drinks

The average regular/non-diet bottle of soft drink in Nigeria contains 350 ml of liquid which is equivalent to approximately 12 fl oz. Each 12 fl oz or 350 ml provides approximately 120 calories of energy [11].

Statistical analysis

Data (percentages) were analysed in groups. The Chi square test and Fisher's exact test were used to test significant differences between groups. The level of statistical significance was fixed at $p < 0.05$.

Ethical considerations

Informed consent was obtained from the principals of participating schools and the study protocol conformed to the ethical guidelines of the 1975 Declaration of Helsinki as modified in 2004.

Results

Frequency of consumption of soft drinks

As shown in Table 1, 97.8% of the males and 97.2% of the females consumed at least one bottle (350 ml) of soft drink a day. This observed gender difference was however not statistically significant ($\chi^2 = 0.38$; $p = 0.5367$). Overall, of the 1000 subjects, 975 (97.5%) consumed at least one bottle of soft drink a day.

Average consumption and overweight/obesity

As shown in Tables 2 and 3, 71 of the 1000 (7.1%) subjects were found to be overweight. Of these, 95.8% consumed at least 350 ml of soft drink a day, while 4.2% consumed less. The observed difference was not statistically significant (Fisher's exact test; $p = 0.4142$). Only 17 (1.7%) of the subjects were obese and all of them (100%) consumed at least 350 ml of soft drink a day. Though no subject who consumed less than 350 ml per day was obese, the difference was not statistically significant (Fisher's exact test; $p = 1.0000$). The prevalence rates of obesity and overweight were 1.7% and 7.1% respectively and the quantity of soft drinks consumed had no significant effect on these values.

Influence of the presence of vendors in school on the amount of soft drinks consumed

Table 4 — shows that more students (98.0%) consumed at least 350 ml of soft drinks a day in the school without a vending shop than in the one with a shop (97.1%). There was no statistically significant difference in consumption. ($\chi^2 = 0.79$; $p = 0.3755$).

Table 1 Average daily consumption of regular/non-diet soft drinks by secondary school adolescents in Calabar, Nigeria

Volume (ml)	No. of males (%)	No. of females (%)	Total (%)
<350	11 (2.2)	14 (2.8)	25 (2.5)
>350	490 (97.8)	485 (97.2)	975 (97.5)
Total	501 (100)	499 (100)	1000 (100)

$\chi^2 = 0.38$, $p = 0.5367$ (not significant).

Table 2 Relationship between average daily consumption of regular/non-diet soft drinks and overweight among secondary school adolescents in Calabar, Nigeria

Average consumption/day (ml)	Overweight		Total no. (%)
	Present no. (%)	Absent no. (%)	
<350	3 (4.2)	22 (2.3)	25 (2.5)
⩾350	68 (95.8)	907 (97.7)	975 (97.5)
Total	71 (100)	929 (100)	1000 (100)

Fisher's exact test, $p = 0.4142$ (not significant).

Table 3 Relationship between average daily consumption of regular/non-diet soft drinks and obesity among secondary school adolescents in Calabar, Nigeria

Average consumption/day (ml)	Obesity		Total no. (%)
	Present no. (%)	Absent no. (%)	
<350	0 (0)	25 (2.5)	25 (2.5)
>350	17 (100)	958 (97.5)	975 (97.5)
Total	17 (100)	983 (100)	1000 (100)

Fisher's exact test, $p = 1.0000$ (not significant).

Physical activity and hours spent watching television

A majority (80.1%) of the subjects engaged actively in physical activity most days of the week. This included walking to school, informal out door games like football, running errands on foot and fetching water for domestic use. Most of the subjects (68.3%) watched television for less than two hours while 31.7% watched for at least two hours.

Discussion

This study shows that there is a high rate of consumption of soft drinks among adolescents in Nigeria. Nearly all (97.5%) subjects consume at least one soft drink a day comparable to figures from studies in western countries, where 56—85% or more did so [13,14]. Though more males were found to consume at least one bottle (350 ml) of soft drink a day, no statistically significant sex difference was demonstrable. In contrast, other studies have consistently shown that males were greater consumers of soft drinks [4,13—15]. No clear explanation has been given so far for this gender difference.

Soft drink companies in Nigeria are engaged in very aggressive advertisement and marketing. Consumers and sellers are enticed by attractive prizes which are only won after large volumes of soft drinks have been consumed or sold. These companies also establish vending shops in and around schools as well as in other recreational areas such as amusement parks and stadia. Prices of these drinks are usually lower at these centres to further encourage consumption. The implication is that developing countries are at risk of the consequences of over consumption of soft drinks.

The free school lunch programme which the Federal Government of Nigeria initiated as part of the Universal Basic Education (UBE) programme in 2004 should be fully implemented without delay in all schools. Sales of soft drinks in and around schools

Table 4 Influence of vendors on the daily consumption of regular/non-diet soft drinks by secondary school adolescents in Calabar, Nigeria

Volume (ml)	School with vendor	School without vendor	Total (%) No. (%)
	No. (%)	No. (%)	
<350	16 (2.9)	9 (2.0)	25 (2.5)
⩾350	537 (97.1)	438 (98.0)	975 (97.5)
Total	553 (100)	447 (100)	1000 (100)

$\chi^2 = 0.79$; $p = 0.3755$ (not significant).

should be discouraged and replaced with milk products.

Soft drinks constitute a significant proportion of total energy intake in these adolescents. This contribution has been documented earlier in western populations [16]. These drinks represent energy added to that from other dietary sources [2]. This is because children and adolescents do not reduce the amount of food they eat at meals despite the calories they consume in soft drinks. The more soft drinks they consume, the greater their caloric intake. Obesity and overweight are likely consequences of over consumption, which is a problem particularly when energy is consumed in liquid form [17].

This study has not demonstrated a significant relationship between obesity /overweight and the amount of soft drinks consumed. This could be attributed to the fact that the majority of our subjects were still physically active being engaged in informal outdoor games like football, walking to school, fetching water for domestic use and running errands on foot. Television viewing is still not common-place as most subjects spent less than two hours watching television. The role of excessive television viewing and reduced physical activity on the increased prevalence of overweight and obesity has been frequently observed in several studies [18—20]. This is explained by the fact that television viewing causes a reduction in resting energy expenditure and reduces physical activity. It also encourages the consumption of unhealthy food items including soft drinks.

The availability of soft drinks in the school or home has been identified as a factor associated with over consumption [21]. Findings in this study did not show any significant difference in consumption in the school with a soft drink vending shop and the school without one. This may be explained by the fact that the subjects, being day students, may be patronizing vending shops outside the school on their way to or from school. The availability of soft drinks at home, which may be influenced by the soft drink consumption habit of parents, may also contribute as most of consumption may be taking place there.

The association between consumption of soft drinks and obesity has been established in some studies [22,23] while not in others [24,25]. Our study did not establish a relationship probably because most of our subjects are still physically active and television viewing is minimal. The overall nutritional status of adolescents in this region of the country may also play a vital role here. A recent study has shown than meals consumed by adolescents in south eastern Nigeria are generally of poor nutritional value resulting in widespread under nutrition [26]. These meals are made up mainly of carbohydrates with little protein and fat. It follows therefore that energy input in our subjects may actually be lower than expenditure thus soft drink related caloric intake would likely not be associated with obesity/overweight. It is expected however that as economic development continues, nutritional status will improve, adolescents will become less engaged in physical activity and television viewing will become more attractive. The prevalence of overweight and obesity may increase if the present rate of consumption is sustained. This in turn will lead to the development of other cardiovascular risk factors in these adolescents, which may persist into adulthood and increase the burden of cardiovascular disease. The variability in study design has made the interpretation of the likely impact of consumption of soft drinks on the development of obesity difficult resulting in varied conclusions.

In conclusion, health education programmes on the need to limit the consumption of soft drinks should be targeted at adolescents and their parents. Policies that regulate the excessive promotion of soft drinks should be put in place.

References

[1] Committee on school health. Soft drinks in schools. Paediatrics 2004;1:153—4.
[2] Bellisle F, Rolland-Cachera MF. How sugar containing drinks might increase adiposity in children. Lancet 2001;357: 480—549.
[3] Heller K, Burt BA, Eklund SA. Sugared soda consumption and dental caries in the United States. Am J Clin Nutr 1990;52: 246—53.
[4] American academy of paediatrics committee on nutrition. Calcium requirements of infants, children and adolescents. Paediartics 1999;104:1152—7.
[5] Gleason P, Suitor C. Children's diet in the mid 1990's Dietary intake and its relationship with school meal participation. Alexandria VA; US department of Agric, Food and Nutrition Service.. Office of analysis, nutrition and evaluation 2001.
[6] Must A, Jacques PF, Dalla GE, Bajema CJ, Dietz WH. Long term morbidity and mortality of overweight adolescents. N Engl J Med 1992;327:1350—5.
[7] Must A, Spadano J, Conkley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. JAMA 1999;282:1523—9.
[8] Blumethal D. Controlling health care expenditures. N Engl J Med 2001;344:766—9.
[9] Ansa VO, Odigwe CO, Anah MU. Profile of BMI and obesity in Nigerian children and adolescents. Nig J Med 2001;10(2): 78—80.
[10] Cole T, Bellizi MC, Flegal KM, Dietz WH. Establishing standard definition for child overweight and obesity. Worldwide international survey. BMJ 2000;320:1240—3.
[11] Whang ED. Calories in soft drinks.<www.online-ambulance.com>.Copyright 2004—2005A.

[12] Prochaska JJ, Sallis JF, Long BA. A physical activity screening measure for use with adolescents in primary care. Arch Paedtr Adolesc Med 2001;155:559.
[13] Yule A. Increased soft drink consumption is contributing to an increase incidence of obesity. Nutr Bytes 2002(8):1—5.
[14] Forshea RA, Storey ML. Total beverage consumption and beverage choice among children and adolescents. Int J Food Sci Nutr 2003;54:297—307.
[15] West DS, Bursac Z, Quimsy D, Prewitt TE, Spatz T, Wash C, Mays G, Eddings K. Self reported sugar sweetened beverage intake among college students. Obesity 2006;14:1825—31.
[16] Pereira MA. The possible role of sugar sweetened beverages in the obesity aetiology: a review of evidence. Int J Obes (Lond) 2006:S28—36.
[17] Mattes RD. Dietary compensation by humans for supplemental energy provided as ethanol or carbohydrate or fluids. Physiol Behav 1996;59:179—87.
[18] Committee on Communications. Children, adolescents and television. Paediatrics 1995;96:786—7.
[19] Barlett SJ, Crespo JC, Cheskin LJ, Pratt M. Relationship of physical activity and television watching with body weight and level of fatness among children. JAMA 1998;279: 938—42.
[20] Grund A, Krause H, Siewers M, Rieckert H, Muler MJ. Is TV viewing an index of physical activity and fitness in over weight and normal children? Public Health Nutr 2001;4(6): 1245—51.
[21] Grimm GS, Harnack L, Story M. Factors associated with soft drink consumption in school aged children. J Am Diet Assoc 2004;104(8):1244—9.
[22] James J, Thomas P, Cavan D. Preventing an increase in childhood obesity by reducing consumption of carbonated soda: cluster randomized controlled trial. BMJ 2004;328: 1237.
[23] French SA, Hannan PJ, Story M. School soft drink intervention study. BMJ 2004;329:E315—6.
[24] French S, Morris P. Assessing the evidence for sugar sweetened beverage aetiology of obesity-a question of control. Int J Obes (Lond) 2006;Suppl. 3:S37—9.
[25] James J, Kerr D. Prevention of childhood obesity by reducing soft drink. Int J Obes (Lond) 2005;Suppl. 2:S54—7.
[26] Ukegbu PO, Onimawo IA, Ukegbu AU. Nutritional status and energy intake of adolescents in Umuahia urban, Nigeria. Pakistan J Nutr 2007;6(6):641—6.