

Lifestyle and Nutrition Profile of Overweight and Obese School Children in the Ga-East District of Ghana

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Abstract: Understanding the dietary and physical activity behaviours of children and adolescent can aid the design of effective interventions to control childhood obesity. Our study assessed the dietary and physical activity behaviours and nutritional status of overweight/obese school children. A cross-sectional study design was employed. Information on body weight, height, body fat, food choices, diet and physical activity behaviours were collected on a random sample of 475 school children aged 8-18 years from August 2009 to August 2010. Biochemical data were collected on a sub-sample (n = 107) of the participants. Mean BMI for females and males were 27.0±4.2 and 27.0±7.0 kg/m², respectively. About 60% reported consuming no fruits or vegetables, while 79% preferred fried foods over other forms of cooked food. Majority (60.9%) engaged in <60 min of physical activity a day. Significant number of children had Hb below 12 mg/dL (40.1% of females and 41.8% of males). Acceptable levels of fasting blood cholesterol (<170 mg/dL) and glucose levels (70 to 130 mg/dL) were recorded for majority of the participants (97.2 and 96.3%, respectively). Dietary and physical activity behaviours of the participants were generally poor. High blood glucose and cholesterol levels found among some of the school children studied is a public health issue and calls for immediate action. Innovative ways to improve consumption of fruits and vegetables and increase physical activity among children are needed.

Keywords: Blood cholesterol, body mass index, dietary behaviour, hemoglobin, obesity, overweight, physical activity

INTRODUCTION

Evidence in recent years suggests that childhood obesity is growing rapidly across the globe. The rate of growth is alarming considering that overweight and obesity are major risk factors for serious health consequences, including, type 2 diabetes, cardiovascular diseases, osteoporosis and some cancers (Freedman *et al.*, 1997; Reilly *et al.*, 2003; Lobstein *et al.*, 2004; Viana *et al.*, 2008).

Causes of childhood obesity have been attributed to changes in dietary patterns characterized by a low intake of vegetables and fruits, frequent snacking and high intakes of energy-dense foods coupled with increased sedentary activities among children (Reilly *et al.*, 2003; Adair and Popkin, 2005). Consumption of unbalanced meals, particularly rich in calories but low in nutrients has also been shown to be the cause of serious deficiencies in important nutrients like iron seen in obese children (Pinhas-Hamiel *et al.*, 2003; Neade *et al.*, 2004).

Although, Ghana like many other developing countries has not been spared of the childhood obesity epidemic and that it is on the rise in the country, there is currently no documented record on the dietary and physical activity behaviours of overweight and obese children. Understanding the dietary and physical activity behaviours of Ghanaian children and adolescent is however important in designing appropriate effective interventions to control the epidemic. This study therefore sought to assess the dietary and physical activity behaviours of overweight/obese school children as well as their nutritional status.

MATERIALS AND METHODS

Study design: A cross-sectional study approach was employed.

Study area: Study was carried out in some selected schools in the Ga-East Municipality of Ghana from August 2009 to August 2010.

Study population: Four-hundred and seventy-five (475) overweight/obese school children aged 8-18 years were randomly sampled from 32 schools; 15 private and 17 public schools. Of the total schools selected, 27 were basic schools and the remaining 5 were Senior High Schools (SHS).

Measurements: A semi-structured questionnaire was administered to solicit information on socio-demographic variables like age and gender of child, ethnicity, educational and occupational status of parents as well as on food choices, dietary and physical activity behaviours.

Nutritional status: Weight was measured on standardized, weighing scales (Model QIE-2003A; EMC China) with the pupils wearing only school attire and no shoes. No corrections were made for the weight of underclothing or socks worn during the measurement. Height was measured on standardized stadiometer (Model HM200P Charder USA) according to the following procedure: no shoes, heels together, participants' heels, buttocks, shoulders and head touching the vertical wall surface with line of sight aligned horizontally. Height and weight were all measured in duplicate, to the nearest 0.1 cm and 0.1 kg, respectively and the averages of these two measurements were used to calculate the BMI as weight in kilograms divided by height in meters squared (kg/m^2). Each participant was classified as overweight (BMI z-score between 1 SD and 2 SD) or obese (BMI z-score >2 SD) according to the 2007 WHO BMI-for-age charts. The percentage body fat of each student was measured using the *hand-held body fat analyzer* (Model HBF360; Omron Japan), which works on the principle of bioelectric impedance analysis.

In the case of percentage body fat, the conventional cut-off ($\geq 25\%$ for boys and 30% for girls) defined by William *et al.* (1992) was used. Blood glucose was determined using the HemoCue *Glucose analyzer* (Model 201⁺; HemoCue Sweden), blood hemoglobin by the HemoCue *Hb analyzer* (Model 201⁺; HemoCue Sweden) and Total Cholesterol (TC) by the *Lipid profile analyzer* (Model CardioChek PA; POCD Australia). Blood samples were taken in the morning after an overnight fast. Using cut-offs for children by the American Heart Association, acceptable TC was defined as <170 mg/dL, borderline as (170-199) mg/dL and high TC as ≥ 200 mg/dL. Acceptable Blood glucose levels were defined as 90-180 mg/dL according to the cut-offs by the National Diabetes Education Program (2008).

Dietary behaviours: To evaluate dietary habits of children, a semi-structured questionnaire was used to solicit information on frequency of meal (breakfast, lunch, supper and snacks) consumption and on consumption of fruits and vegetables during school days and a typical weekend day. Because we were particularly interested in obtaining information on consumption of energy-dense foods, we collected information on foods like fried rice, *koose* (fried bean balls), sausages, meat-pie, ice-cream, sweets, chocolate, doughnuts, sugar-sweetened beverages using a semi-quantitative food frequency questionnaire.

Physical Activity (PA) behaviours: To estimate the PA habits, students were asked about the number of minutes spent watching television or playing video games during a school day and a typical weekend day and about the frequency of after school PA, such as walking, running, skipping, bicycle riding, playing *ampe* (girls jumping, dancing, clapping *game* from Ghana.) or playing soccer.

Ethical consideration: Approval was given by the Institutional Review Board of Noguchi Memorial Institute of Medical Research, Ghana. Written informed consent was provided by participants and their parents/guardians for participation after the objectives of the study have been adequately explained to them and have been assured of confidentiality in the handling of the information they provide.

Statistical analysis: All data analyses were conducted using SPSS (version 16 for windows; Chicago, IL, USA). Continuous variables are presented as mean values and their Standard Deviation (SD) and categorical variables as frequencies, percentages or proportions. For all comparisons, p -values < 0.05 was considered statistically significant.

RESULTS

Table 1 summarizes the subject characteristics. Apart from educational level of participants and occupational status of participant's parents which recorded significant differences, no significant differences were found in the other variables examined. Results indicated that there were more participants from the basic schools than the senior high schools. Also majority of the parents of participants were employed as against those who were unemployed (Table 1). Mean BMI for females and males were 27.0 ± 4.2 and 27.0 ± 7.0 kg/m^2 , respectively

Table 1: Background and socio-demographic characteristics of participants

Variable	Male n (%)	Female n (%)	Total	p-value
Age group (years)				
Before puberty (8-9)	28	43	71	0.083
Puberty (10-14)	83	207	290	
After puberty (15-18)	43	71	114	
Pupils' educational level				
Primary	74	163	237	0.009
Junior High School (JHS)	41	112	153	
Senior High School (SHS)	39	46	83	
School category				
Private	106	213	319	0.591
Public	48	108	156	
Mother's occupation				
Unemployed	4	16	20	0.026
Blue collar	102	239	341	
White collar	48	66	114	
Father's occupation				
Unemployed	2	9	11	<0.001
Blue collar	65	197	262	
White collar	87	115	202	
Ethnicity				
Akan	87	152	239	0.017
Ewe/guan	29	85	114	
Ga/Ga-adamgbe	28	40	68	
Northner/others	10	44	54	

Table 2: Physical and biochemical profile of participants by gender

Variable	All (N = 475) mean±SD	Male (n = 154) mean±SD	Female (n = 321) mean±SD
Age (years)	12±3	12±3	12±3
BMI (kg/m ²)	27±5	27.0±7.0	27.0±4.2
Body fat (%)	31.2±5.2	30.6±6.4	31.5±4.5
Haemoglobin (mg/dL)	12.7±1.5	13.5±1.5	12.2±1.1
Fasting blood sugar (mg/dL)	70.0±19.3	68.9±21.8	70.9±17.5

(Table 2). An average percentage body fat of 31.2±5.2% was recorded. On the whole the biological profile of participants was good except for the iron status where almost half of the students had low values. Significant number of children had haemoglobin levels below 12 mg/dL (40.1% of females and 41.8% of males). Acceptable levels of fasting blood cholesterol (<170 mg/dL) and glucose levels (70 to 130 mg/dL) were found for majority of the children, 97.2 and 96.3%, respectively (Fig. 1).

Results indicated that students ate meals regularly i.e., they usually have breakfast, lunch and supper with snacks in between. However data on food choices showed that about 60% of them consumed no fruits or vegetables in a day while 79% preferred fried foods over other forms of cooked food (Fig. 2). Intake of fruits and vegetables was generally low; approximately 1.6 and 2.4 servings/day, respectively whilst an average of 314 mL/day of sweetened beverage was recorded. Of the number (171/475) who consumed fruits on a daily basis, only 37.8% (63/171) ate the recommended number of servings per day i.e., 2-4 servings. A similar

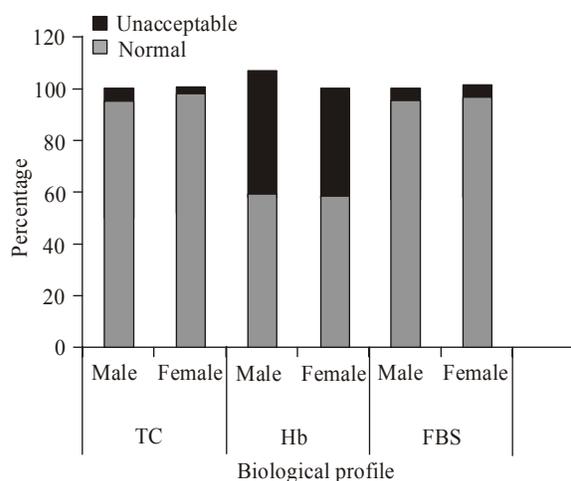


Fig. 1: Biochemical profile of participants by gender

trend was observed for the intakes of vegetables where almost all (95.8%; 139/167) of the respondent who reported to eat vegetables daily had less than 3 servings of these in a day.

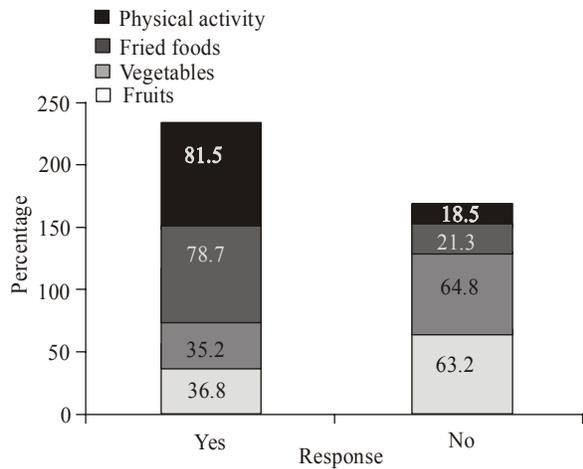


Fig. 2: Response on diet and physical activity behaviours of participants

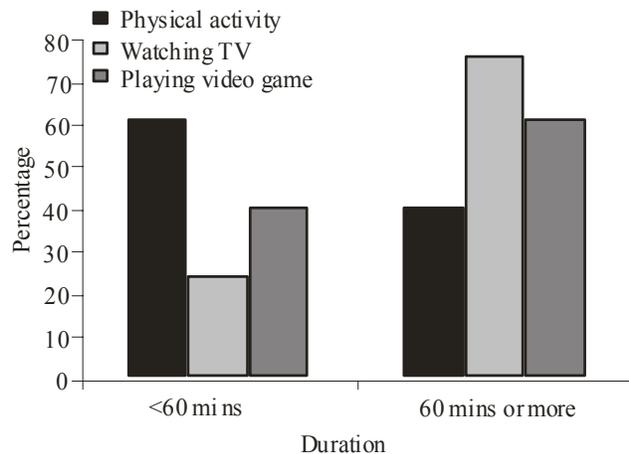


Fig. 3: Time spent on physical activity, watching TV and playing video games

Although majority of the participants (387/475; 81.5%) said they engage in some form of PA on daily basis, only a little over a third (90/387; 39.1%) of them engaged in ≥ 1 h of PA in a day (Fig. 3). Participants spent more time watching television and playing video games than engaging in physical activities. An average screen time of approximately 1.5 h/day compared to PA time of approximately 50 min/day were recorded.

DISCUSSION

The obesity epidemic has not only affected developed countries but also developing countries as most people are going for westernized diet i.e., diet rich

in sugars and fats but low in fruits and vegetables. In our study, although we observed a regular eating pattern for most of the participants, food choices were generally poor as these children preferred high caloric foods to diet rich in fruits and vegetables. This finding is similar to what Olivares and his colleagues found in their study about food advertisement and preferences among school children. They observed that this age-group often remembered and purchased foods like French fries, sweet and salty snacks, soft drinks and fast foods (Olivares *et al.*, 1999). This observation may be attributed to the type of foods made available and are accessible to the students. In a personal communication with some participants, they revealed that they do not consume fruits and vegetables daily because they don't find them in school or at home. Also from observations made by the research team, most school canteens make available candies, cookies, sugar-sweetened beverages, doughnuts, meat-pie and sausages but hardly sell fruits to students. Even in schools where fruits were sold on the school campus or close to the campus, only two or less varieties of fruits are available limiting the choices made by students.

The nutritional status of participants in the current study was generally poor as reflected by the average values recorded for BMI, percentage body fat and hemoglobin. Poor iron status, high BMIs and body fat may be attributed to the consumption of unbalanced meals, particularly rich in calories but low in nutrients. It may also mean that the diet consumed by these children lack or contain inadequate amount of iron-rich foods like meat, fish, beans, green leafy vegetables and nuts, among others. Several studies have confirmed that overweight and obese children are at higher risk of nutrient deficiencies. One such study was in the USA, where a study on almost 10,000 children between the ages of 2 and 16 years reported a significantly higher prevalence of iron deficiency among obese children. The correlation observed between obesity and iron deficiencies was so strong that the authors recommended considering obesity as an independent risk factor for anemia (Nead *et al.*, 2004). This is a call for concern because of the grave consequences anemia poses on growth, motor and mental development in children. Apart from causing impairment in growth, motor and mental development of children, anemic children are also known to exhibit shortened attention span and decreased alertness thus affecting their performance in school. In very severe cases, they may suffer an increased risk for stroke (Brotanek *et al.*, 2007). It follows then that if this is not controlled the brain power and productivity of these children who are

the nation's future leaders will be lost which will consequently lead to a massive drain on the nation's human resource, hence its growth and development.

Our study also found that intake of fruits and vegetables were very low among participants. Most of these children failed to meet the recommended servings of fruits and vegetables i.e., 2-4 servings and 3-5 servings/day, respectively. Elsewhere, some studies have observed similar findings (Kennedy *et al.*, 1995; Brady *et al.*, 2000; Olivares *et al.*, 1999). It is therefore not surprising that majority of our participants had poor nutritional status (high BMIs and percentage body fat and low hemoglobin levels). Fruits and vegetables play vital roles in weight management because of their high water and fiber contents. Research has it that replacing foods of high energy density (high calories per weight of food) with foods of lower energy density, such as fruits and vegetables, can be an important part of a weight management strategy (Center for Disease Control and Prevention, 2007). Apart from this benefit, fruits and vegetables are also rich sources of vitamin and minerals. Vitamin C for instance plays a key role in preventing anemia by helping to increase the amount of iron absorbed in the stomach (Vander *et al.*, 1998). These poor behaviours in children if not controlled now may be formed into habits which will be more difficult to control. It therefore means that there is an urgent need to implement nutrition education programmes to address the importance of consuming more fruits and vegetables and reducing intakes of high caloric foods as well as push for developments of policies that encourages healthy eating habits among children.

It has been well documented that increased sedentary lifestyle is an important contributor to childhood obesity (Uauy *et al.*, 2001; Albala *et al.*, 2002). We observed poor physical activity behaviours among participants which were characterized by more time spent in front of the screen and less time on physical activity. This behaviour together with their poor eating behaviours might have contributed to their BMI status being above what is recommended for their sex and age. Several studies have demonstrated that the amount of time children spend watching television influences PA (Dietz and Gortmaker, 1985) and thus their weight status (Crespo *et al.*, 2001). Also of much concern is the high tendency of children eating snacks whilst sitting in front of the screen as shown by Parvanta *et al.* (2010). It has also been shown in these studies that children and adolescents who paid attention to TV commercials and watched long hours of television are more likely to become obese and suffer related diseases. Another major observation we believe

needs to be addressed is the attitude of schools towards physical activity. Most of the schools visited did not have any appropriate physical activity structures in place making it difficult for children to engage in PA. Even with schools which provided physical education as part of their curricula, only a short time (30 min at most) is allocated to this thus participants are limited in the duration of PA during school hours. At home most of the children complained their parents do not allow them to engage in PA for fear of hurting themselves and do not allow them walk to school because of dangers involved in walking by the roadside.

CONCLUSION

Our findings show that overweight and obese school children have inadequate dietary and physical activity behaviours. These behaviours may have resulted in the poor nutritional status observed i.e., the prevalence of averagely high BMI, high percentage body fat and low levels of hemoglobin. They also exhibited poor physical activity behaviours in that they spent less hours engaging in any form of physical activity but more time in front of the screen. This suggests that for childhood obesity control to be achieved, concerted efforts from stakeholders like the family, school, community, media, government and food industry is crucial to create an environment that encourages healthy eating behaviours among children. Innovative ways to improve consumption of fruits and vegetables and increase physical activity among children are also urgently needed.

ACKNOWLEDGMENT

We appreciate the funding support given by University of Ghana, Legon through the Office of Research of Innovation and Development (ORID). Our heartfelt gratitude goes to all our participants and their parents/guardians, school heads and their staff for their co-operation and support given in various ways.

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