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Effect of junk food on body mass index (BMI) of adolescent school children in Ukwuani Local Government Area (LGA) of Delta State

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There are great concerns in Nigeria about lifestyle diseases which are now emerging among adolescent school children due to emphasis on the food taste rather than nutritional value of the food. Survey of the consumption pattern of junk foods among adolescent school children drawn from both public and private school in Ukwuani LGA of Delta State, Nigeria was carried out. The study sample is class three (3) of the Junior Secondary School (JSS 3) using random sampling techniques. Early stages in human development often mark the harbinger of overweight in school children because most of them at this age could hardly resist the attraction and urge to consume junk food. Survey analyses show an average consumption of 92.78% as against 7.22% non-consumption of junk food. The mean and standard deviation based on daily consumption of junk foods commonly found in schools within the region was 2.36 and 0.74, while that of weekly consumption was 2.56 and 0.85, respectively. There is negligible significant difference between daily or weekly consumption of these food types. The mean and standard deviation of junk food intake was correlated with weight and height of the students in computing the body mass index (BMI). The bio-data was statistically analyzed using students t-test and the null hypothesis was rejected. By implication, it was shown that junk food consumption influences the anthropometric index of the study sample. The consumption of junk food by adolescent school children as indicated by the results show that it has a considerable effect on the BMI and other consequent health implications.

Key words: Junk food, overweight, height, consumption pattern, adolescent, calories.

INTRODUCTION

Junk food is a specific variety of convenience food which is commonly associated with high energy density. There have been several attempts by researchers on the concept of junk food. It was referred to as food with little or no nutritional values which have ingredient that are considered unhealthy (Payab et al., 2015). Vasathakumar (2016) defined junk food as pre-packed meals or ready-to-eat convenience food. Other studies used the style of service to represent junk foods from other convenience foods. Several researchers have argued, that it is

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extremely difficult to design a balanced diet based exclusively on junk food since most junk foods have a high fat and salt content (Fortin and Yazbeck, 2015; Zhao et al., 2017; Goel et al., 2013). Common junk food includes, fried chicken, burger, sausage, chocolate, sweets, biscuits, ice-cream, hot dogs, soft drinks, popcorn with sugar, dankuyar, corn pudding, coconut candy, kpaokor, plantain chips (Kpekere), dry sweet, gum sweet etc. High sugar cereals, particularly, those targeted at children are also considered as junk foods. Junk foods have ingredients considered unhealthy when regularly eaten, or those considered unhealthy. In the public interest, junkfood is defined as typically ready-to-eat and convenience foods containing high levels of saturated fats, salt, sugar and little or no fruit, vegetables or dietary fiber, and are considered to have little or no health benefits.

Realizing the continuous increase in health related cases of adolescent and increase in obesity among the categories of students in developing countries (Akpalu and Zhang, 2014), there is the need to determine the possible influence of junk food consumption on the anthropometric indices of the students. Essentially, and as a point of fact, most adolescent students have high tendencies of continuously engaging in junk food consumption because of the length of time they spend during school hours. For instance, in Delta State primary and secondary schools, students resume at 7:30 am to 1:45 pm, while almost all of them, especially in the Junior Secondary School (JSS 3) preparing for examination to the Senior Secondary School (JSS 3) remain in school for extra studies till 5:00 pm throughout the week. In other words, they depend much on the availability ready-to-eat (junk food) within the school environment. Thus, this study is set to determine: 1) the demographic characteristics of adolescent students; 2) frequency of junk food consumption by the adolescents, and 3) influence of junk food consumption on the anthropometric index of the adolescent students.

MATERIALS AND METHODS

The study sample is class three (3) of the Junior Secondary School (JSS 3) using random sampling techniques. The population distribution comprises of thirteen (13) public and fourteen (14) private schools in Ukwuani LGA of Delta North Senatorial District of Delta State.

Quantitative survey questionnaire was developed for this study with the title, “Consumption of Junk Foods Questionnaire (CJFQ)”. The questionnaire items used in formulating it were gathered from the reviewed literature. Total population of boys and girls in public and private schools are 2241 and 1166, respectively. The information that was gathered from the questionnaire was analyzed statistically using simple percentage for the bio-data of the respondents, mean ($\bar{X}$)and standard deviations (SD).

Anthropometric measurement was used in accordance with Fernández San Juan (2006) who explained that anthropometry is the science of measuring the size, weight and height of human body. Height and weight measurement usually vary according to the person’s age and sex. These measurements are used to derive indices such as body mass index (BMI), weight for age, weight for height as well as height for age. The weight of each student was measured after the weighing scale was zeroed and recorded in kg. More so, student’s height was measured and recorded in m. The BMI was computed using Equation 1:

$$BMI = \frac{Weight\ (kg)}{Height\ (m^2)} \quad (1)$$

The sample size was computed using equation 2 as shown:

$$n = \frac{N}{1+Ne^2} \quad (2)$$

Where *N* is the population size, *e* is 0.05 level of significance and n is the sample size, the sampling interval *K* can be calculated using equation 3:

$$K = \frac{N}{n} \quad (3)$$

The probability of selecting a specified unit of population at any given draw is equal to the probability of it being selected at first draw:

$$P\ (E_r\ ) = \frac{1}{N}, \quad (r = 1, 2, \ldots n) \quad (4)$$

Therefore,

$$P\ (E_r) = \frac{1}{N} = P\ (E_1) \quad (5)$$

By addition theory of probability, the chance of any item being included in a sample size *n* is evaluated using equation 6.

$$\sum_{r=1}^{n} P\ (E_r) = \sum_{r=1}^{n} \left(\frac{1}{N}\right) = \frac{n}{N} \quad (6)$$

Furthermore, sample was analyzed statistically using simple percentage distribution. The difference between the WHO standards for BMI and the population of the study was analyzed using students t-test as shown in equation 7.

$$t = \frac{\bar{x} - \mu}{\sqrt{\frac{s}{N-1}}} \quad (7)$$

Where $\bar{x}$ is the mean value of the population sample, μ is the mean value based on WHO standards, *S* is the standard deviation and N is the sample size.

RESULTS AND DISCUSSION

The percentage distribution by gender shows that there were 200 males and 145 females which represent 58.0 and 42.0% of males and females, respectively.

Percentage distribution by school types and age is as shown in Tables 1 and 2 respectively.

Table 1 represents the percentage distribution by school types. There were 249 public schools which is 71.1% and 101 private schools which accounts for the remaining 28.9%. Table 2 shows the percentage

Table 1. Percentage Distribution by School Types

School Type	Frequency	Percentage (%)
Public	249	71.1
Private	101	28.9
Total	350	100

Source: Field Study, 2014

Table 2. Percentage Distribution by Age

Age (yrs)	Frequency	Percentage (%)
11-13	69	20.0
14-16	97	28.1
17-19	68	19.7
20-22	111	32.2
Total	345	100

Source: Field Study, 2014

distribution by age. Students between ages 11-13 years are 69 and represent 20.0%. 14-16 years are 97 and represents 28.1%. Age groups of 17-19 and 20-22 years are 68 and 111 which represents 19.7 and 32.2%, respectively.

Figure 1 shows the percentage preference for consumption and non-consumption of junk food. The junk foods presented are sweets, fried fish, fried potatoes/yam, fried chicken, chocolate, sausages, meat pie, fish pie, chin chi, egg rolls, cake, biscuits, ice-cream, hot dogs, butter/margarine, mayonnaise, bread/toast bread, bread rolls, buns and doughnuts. The frequency of "yes" for the consumption of these junk foods are higher that the frequency of "no" which translates to higher percentages in the consumption of these types of food.

Overweight is a resultant of consuming more energy dense food than the body needs especially when it is not used up through physical activities. In Ukwuani LGA, it is generally observed that majority of the students are overweight and some of them suffer from extreme overweight and consequent obesity. For most people, overweight is a scientific term, a loaded word that triggers anxiety and frustration like gender and ethnicity, while culturally and in line with African tradition, it is generally symbolic to wealth. Weight is an essential part of every person's self-image and when it is out of control, the result is distress. The culture is, to put it mildly, preoccupied with weight. Overweight put strains on the heart; it also diminishes personality and reduces fitness. When one is sufficiently overweight, he/she feels tired and breathless. Correction of overweight calls for fewer calories or more exercises.

Table 3 shows the mean and standard deviation (SD) of the consumption pattern of junk foods. It depicts that sweets, fried fish, chocolate, sausages, meat pie, fish pie, chin chi, egg rolls, biscuits, hot dogs and bread rolls are consumed daily. Fried potatoes/yam, fried chicken, cake, ice-cream, butter/margarine, mayonnaise, bread/toast bread, buns and doughnuts are consumed weekly using the real limits of the mean respectively.

In addition, the consumption pattern of junk food was correlated with the anthropometric indices of the student to examine junk food influence on BMI. The result of the computations was compared with the WHO standards for BMI which indicates that BMI range of 18.5 to 24.9 is normal; 25.0 to 29.9 is overweight while 30 and above is obese as shown in Table 4. Specifically, WHO benchmark for BMI of adolescence between the ages of 5-19 based on 2007 reference is 21.1 kg/m^2. Table 5 gives the sum of data collected to address the influence of junk food on the anthropometric indices of the students.

The data presented in Table 5 shows that the mean response of junk food consumption is 47.77, while those of weight and height are 45.93 kg and 1.75 m^2 respectively. The values show that the mean BMI of the students' mean is 27.35 kg/m^2. Substituting the variable from Table 5 into Equation 7 where, $\bar{x}$ is 27.35, μ is 21.1 based on WHO standards for 5-19 years of age, S is 6.820 and N is 350:

$$t = \frac{27.35 - 21.1}{\sqrt{\frac{6.820}{350-1}}} = \frac{6.25}{\sqrt{\frac{6.820}{349}}} = \frac{6.25}{\sqrt{0.0195}} = 44.77$$

The degree of freedom $df = N - 1 = 350 - 1 = 349$, and the $t_{critical} = 1.960$

Percentage distribution by age

Students between 11-13 years are 69 in number and represent 20.0%. 14 to 16 years old students are 97 in number and represents 28.1%. Age groups of 17-19 and 20-22 years are 68 and 111 which represents 19.7 and 32.2%, respectively. In other words, ages between 11-19 years represent an average percentile of 67.8% while the ages between 20-22 represents 32.3% of the sample size. By implication and in line with WHO standards at 2007 reference for ages between 5 and 19, the selected sample represents significantly, the adolescent population (de Onis and Lobstein, 2010).

More so, the consumption pattern of junk food was correlated with the anthropometric indices of the student to examine junk food influence on BMI as shown in Table 3. The mean and standard deviation (SD) of the consumption pattern of junk foods depict that sweets, fried fish, chocolate, sausages, meat pie, fish pie, chin chi, egg rolls, biscuits, hot dogs and bread rolls are consumed daily. Fried potatoes/yam, fried chicken, cake,

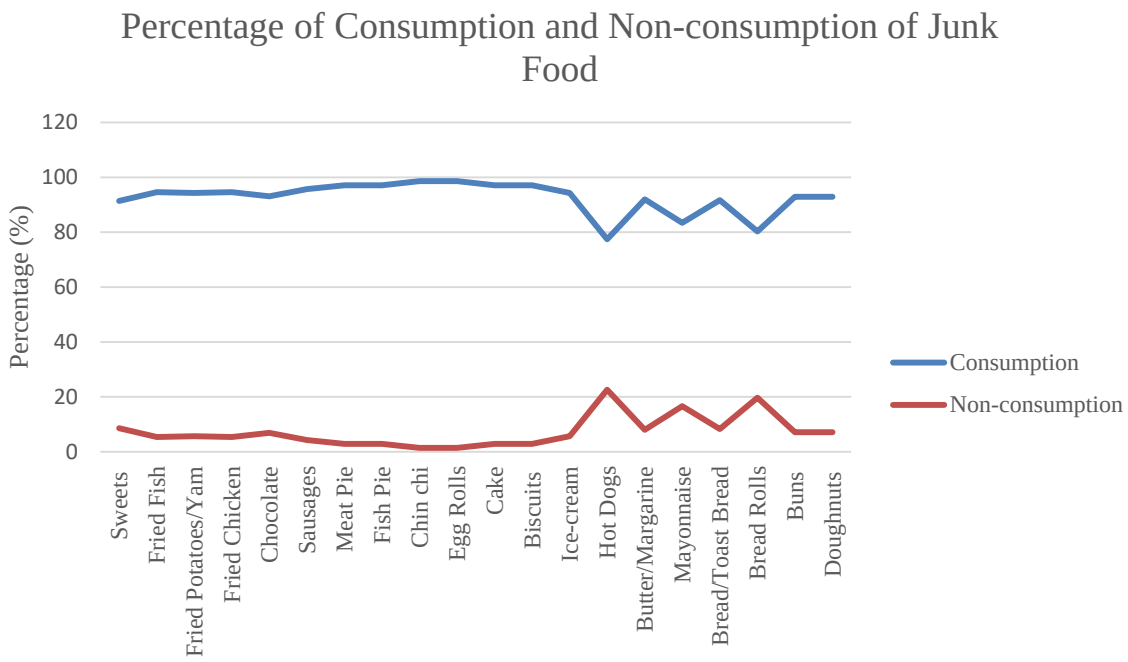

Figure 1. Percentage Distribution of Type of Junk Foods

Table 3. Mean and Standard Deviation of Consumption Pattern of Junk Food

S/No.	Types of Junk Foods	Mean	Standard Deviation	Remarks
1.	Sweets	2.19	0.701	Daily
2.	Fried Fish	2.44	0.749	Daily
3.	Fried Potatoes/Yam	2.51	0.788	Weekly
4.	Fried Chicken	2.57	0.847	Weekly
5.	Chocolate	2.29	0.720	Daily
6.	Sausages	2.35	0.636	Daily
7.	Meat Pie	2.29	0.636	Daily
8.	Fish Pie	2.43	0.705	Daily
9.	Chin chi	2.35	0.670	Daily
10.	Egg Rolls	2.35	0.696	Daily
11.	Cake	2.60	0.921	Weekly
12.	Biscuits	2.37	0.745	Daily
13.	Ice-cream	2.55	0.845	Weekly
14.	Hot Dogs	2.43	0.937	Daily
15.	Butter/Margarine	2.61	0.877	Weekly
16.	Mayonnaise	2.59	0.894	Weekly
17.	Bread/Toast Bread	2.54	0.803	Weekly
18.	Bread Rolls	2.50	0.924	Daily
19.	Buns	2.52	0.825	Weekly
20.	Doughnuts	2.52	0.807	Weekly

Source: Field Study, 2014

ice-cream, butter/margarine, mayonnaise, bread/toast bread, buns and doughnuts are consumed weekly using the real limits of the mean, respectively. Poor dietary pattern once developed eventually become permanent eating pattern which has serious consequences on the BMI which again, corroborate the opinion of Benazeera

Table 4. Classification of Obesity using BMI

Classification	BMI	Risk of Co-morbidity)
Underweight	<18.5	Low (but risk of other clinical problem increased)
Normal range	18.5 – 24.9	Average
Overweight	25.0 – 29.9	Mildly increased
Obese	>30.0	
Class 1	30.0-34.9	Moderate
Class 2	35.0 – 39.9	Severe
Class 3	> 40.0	Very severe

Source: International Association for the Study of Obesity (2011)
Real limit (mean): Monthly: 3.50 – 4.00; weekly: 2.50 – 3.49; daily: 1.50 – 2.49; not at all: 0.50 – 1.49.

Table 5. Mean and Standard Deviation of Influence of Junk Food Consumption on Anthropometric Indices of Students

Variables	N	Mean	Standard Deviation
Junk Food Consumption	345	47.77	11.546
Height (m^2)	350	1.76	0.488
Weight (kg)	350	45.93	7.186
BMI (kg/m^2)	350	27.35	6.820

Source: Field Study (2014)

(2014) as well as Geeta and Sunita (2013).

On the bases of a null hypothesis suggesting no influence of junk food consumption on the anthropometric index of the adolescent students and, an alternate hypothesis stating that junk foods have influence of junk food consumption on the anthropometric index of the adolescent students, the result of the calculated t-value is 44.77 while that of t-critical is 1.960. Since t-critical is less than the t-value calculated, the null hypothesis is rejected which infers that junk food consumption influences the anthropometric index and consequently, the BMI (de Onis and Lobstein, 2010).

If the BMI range from 18.5 to 25, it suggests that the person has normal weight, BMI of 25 to 30 indicates overweight, 30 or higher is referred to as obesity. Obesity in children has the risk of hypertrigleceridemia, hypercholesolemia, hyperinsulinemia, type 2 diabetes mellitus, hypertension, respiratory disorder, orthopedic and psychological problems during their youth (Fortin and Yazbeck, 2015; Zhao et al., 2017; Goel et al., 2013). In line with Akpalu and Zhang (2014), food, health and care are the major requirements for nutritional wellbeing. Food preferences that are developed early in life can also influence adult food choices if poorly handled. Furthermore, it is during the adolescent period that they experiment and stern developing habits.

Conclusions

Results of the analyses show a direct influence of junk food on the BMI. The results of the Student's t-test support the alternate hypothesis that junk food consumption influences the anthropometric index of adolescent school children. Furthermore, daily or weekly and continuous consumption of examined food types have been shown to have some consequences on the BMI which have other implications in health.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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