



# Evaluating Patterns of Snacks Consumption, Energy Nutrient Intakes Among In-School Adolescent Students in Ibadan, Nigeria

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**Abstract** - Snack consumption patterns among in-school adolescent students is important because of its association with energy and nutrient intakes and also body mass index (BMI). The main aim of this research study is to evaluate the snack consumption patterns and assess how the frequency of snack consumption is associated with energy, nutrient intakes, and BMI of the junior secondary school students. This study made use of anthropometric measurement to assess the BMI; evaluated the snacking patterns with questionnaire while the dietary data was collected by food frequency questionnaire (FFQ) and one-day 24-hour diet recall. A total of 78 in-school adolescent students aged 10-15 years old from two junior secondary schools in Ibadan Nigeria were involved in the study. Results showed that most respondents (43.8%) consumed snacks once daily. More than half (91%) of them reported having snacks in the afternoon hours. The snacks commonly consumed include fresh fruits, doughnuts, egg rolls, plantain chips, buns, sausage rolls, soft drinks and yoghurts. The most common meal and snack patterns in the majority of the student (25%) was composed of three main meals plus three snacks daily. There was significant difference between meal and snacking patterns in majority (25%) composed of three main meals plus two snacks daily.

**Keywords:** *In-school, adolescent, students, energy, nutrient intakes, snacks*

## 1. Introduction

In-school adolescent in their teen age who vary significantly need to be considered for health care in their growth to adulthood (WHO, 2007: 660-167). Nutritional needs at this age period is high compared to other periods in the life span to attain optional growth and development. The nutritional intake is very important to ensure long-term health promotion and development of healthy eating behaviour in the future as it may predict the occurrence of obesity and other diet-related chronic diseases at a later stage in life (Neumark Sztainer et, Story, Perry & Lassey 2007). Poor snacking is often associated with undesirable health outcomes and dietary patterns and consequently regarded as a contributing factor in the development of overweight and obesity (Savidge, MacFarlane, Ball, Worsley & Crawford 2007).

Previous studies that examined the association between snacking and body mass index have yielded mixed results as the effect of snacking is difficult to be examined due to the different approach and definition of snacking used in the previous studies (Johnsen & Anderson 2010).

It is often perceived that snack foods are high in fat and sugar and hence harmful and not ideal for healthy eating (Astrup, Bovy, Nackenhorst & Popova 2006).

A research study conducted in the UK defined snacking as food or drink eaten between main meals (Chaplin & Smith 2011) and also based on the time criterion (Gregon & Maffeis).

In-school adolescents seldom select snacks based on taste over nutrition, and they more often choose salty and crunchy foods as snacks over healthier alternatives (Olumakaiye, Ogbimi, Ogunba, & Soyebola 2008).

Snacking may be associated with less frequent consumption of meals, which may be hazardous to health since maintaining regular meal patterns are associated with nutrient dietary diversity, healthier food choices and better nutrient intakes (Wart 2006). The effect of high consumption of fatty snacks can constitute a health problem for adolescents, hence the need to conduct this research study. When snacks are taken frequently, it results in excess energy intake and non-balanced nutrient intakes, subsequently causing the increase of overweight and obesity among the in-school adolescents (Niklas, Yang, Baranowski, Zakeri & Berenson 2003). A research study carried out in Korea revealed that frequent snacking influences the intake of macronutrient included carbohydrates proteins, fat and micronutrients such as calcium, folate and iron (Kim & Kim 2010).

BMI is seldom used as indicator to predict changes in body weight status during the youthful age, hence previous study showed lack of association between snacking and BMI among the in-school adolescent students (Kerr, Rennie, McCaffrey, Wallace, Hannon-Fletcher & Livingstone 2009).

This study might indicate that snacking patterns have some influences on energy and nutrient intakes but not BMI among the in-school adolescent students. In this research places to obtain snacks and expenses used to purchase snacks were evaluated. Snacking patterns was focused on meal and snacking pattern to determine whether it is associated with energy and nutrient intakes as well as BMI among the in-school adolescent students. The research study discussed the need for the consumption of nutritious snacks other than the junk ones that may lead to chronic diseases. The main aim of this study is to evaluate the snack consumption patterns and assess how the frequency of snack consumption is associated with energy, nutrient intakes among in-school adolescents.

## **2 Materials and Methods**

**Sampling and study location:** The study was conducted in Ibadan, Nigeria. Two junior in-schools were randomly selected for the study. Verbal consents of the adolescents were sought and an approval obtained.

**2.1 Ethical Approval:** Formal approval was obtained from the Ministry of Education, Lagelu Local Government, Ibadan, Nigeria to conduct the study, and the management of the selected public in-school's adolescents. A total of 100 students were selected by systematic random sampling method to participate in the study. Only 78 respondents were included in the analysis as there were a small group of 22 who did not provide complete information and therefore excluded from the study.

**2.2 Questionnaire:** A semi-structured questionnaire was developed to collect information on the socio-demographic characteristics information including gender, date of birth, ethnicity, parental occupation and monthly household income, snacking patterns including frequency and time of snacking, snacking context, places to obtain snacks and expenses incurred on purchase of snacks, pattern of snacks consumption and dietary intake.

### **2.3 Food frequency questionnaire (FFQ) and 24-hour dietary recall.**

The FFQ was used to collect information on the type of snacks frequently consumed by the respondent; the 24-hour dietary recall was used to assess dietary intake information, the meal and snacking pattern.

Any food consumed during the period of 8.00 am – 10.00 am to 12.00 – 2.00 pm and 6.00 – 8.00 pm were classified as main meal representing breakfast, lunch and dinner respectively.

All meals and snacks consumed by respondents were categorized into 6 patterns (Kim and Kim 2010). The most frequent eaters consumed 3 meals with 3 snacks (3M + 3S), the 5 times eaters consumed 3 meals with 2 meals with 1 snack (3M + 1S), non-snackers consumed 3 meals (3M), meal skippers

consumed snacks frequently ( $\leq 2M \pm 2, 3S$ ) and meal skippers consumed snacks only one time or never ( $\leq 2M \pm 0, 1S$ ).

### 3 Data Analysis

All statistical analyses were conducted using statistical package for social sciences (SPSS) version 23.0. Descriptive statistics were generated as frequencies, means, standard deviations and percentages for all variables. Chi-square test was used to examine associations between body weight status and snacking patterns. One-way ANOVA was employed to determine differences in energy and nutrient intakes and BMI between the meal and snacking patterns. Nutrient calculation systems, Nutrical Software was used for energy and nutrient analysis. The results were considered to be significant at the 5% level.

#### Socio-demographic characteristics

Descriptive statistics of the sample were presented in Table 1. Respondents in the sample ranged from 10-14 years with an average age  $\pm 0$ . Years. The ratio of male to female respondents was 1:1.02 of the 100 respondents, there were 40 (40%) Oluyole, 25 (25%) Lagelu and 35 (35%) Egbeda.

### 4 Results and Discussion

**Table 1: Socio-demographic characteristics of respondents**

Demographic profile	No of respondents N = 100	Percentage (%)
<b>Gender</b>		
Male	52	52%
Female	48	48%
<b>Age</b>		
10 years	38	38%
12 years	32	32%
14 years	30	30%
<b>Ethnicity</b>		
Oluyole	40	40%
Lagelu	25	25%
Egbeda	35	35%
<b>Monthly household income class</b>		
Underweight	20	20%
Normal	30	30%
Overweight	24	24%
obese	26	26%

#### 4.1 Snacking Patterns

The findings show that most of the respondents 36.88% like to snack while only 1.41% do not like to consume snacks.

Table 2 shows the snacking patterns including frequency of snacking daily, time of snacking daily, time of snacking, snacking context, places to obtain snacks and expenses to purchase snacks. Majority 36.88% snacked once a day, 44.68% snacked twice a day, 17.02% snacked three times or more daily and only 1.41% did not snack daily. The percentage of respondents who snacked once a day in the present study is higher than the previous study which shows that most of the respondents, which is only 36.88% snacked once a day.

**Table 2: Snacking patterns of respondents**

<b>Snacking patterns</b>	<b>No of respondents N = 100</b>	<b>Percentage (%)</b>
<b>Frequency of snacking daily</b>		
Never	2	1.41%
Once	1. 52	36.88%
Twice	63	44.68%
3 times or more	24	17.02%
<b>Time of snacking</b>		
Morning snack (between breakfast and lunch time)	10	7.52%
Afternoon snack (between lunch and dinner time)	91	68.42%
Evening snack (after dinner time)	32	24.06%
<b>Snacking context</b>		
After school	16	10.26%
While watching television	83	53.20%
While hanging out with friends	24	15.38%
While doing homework or revision	30	19.23%
In the middle of the night	3	1.92%
<b>Places to obtain snacks</b>		
Home	24	18.46%
School canteen	4	3.07%
Fast food restaurant	10	7.69%
Grocery shop/supermarket	92	70.77%
<b>Monthly expenses for snacks</b>		
N1000 or less	94	74.02%
N1000 – N1500	27	21.26%
More than N1500	6	4.72%

Most respondents (68.42%) according to the report took afternoon snack, between lunch and dinner time. Other respondents (24.06%) snacked after dinner time, which is evening snack and only 7.52% snacked between breakfast and lunch time, which is morning snack. The most common context for snack is during watching television (53.20%). This was followed by 10.26% respondents that snacked after school period. There were also 3% respondents who consumed snacks in the middle of the night and 1.92% who snacked while doing homework or television.

Furthermore, the findings show that most respondents (70.77%) obtained their snacks from the grocery shops or supermarkets, 18.47% taking snacks at home, 10% snacked at fast food restaurants and only 7.69% obtained snacks from school canteen. The present study also shows that majority (74.02%) only spent N1000 or less for snacks, 21.26% spent N1000 – N1500 and only 4.72% spent more than N1500 on a monthly basis.

#### **4.2 Types of snacks frequently consumed**

Table 3 shows the percentage of frequency for each type of snacks between meals by respondents during a week before the study was carried out. Snacks foods most frequently consumed by the respondents everyday within a week included fresh fruits (13.5%), doughnuts (4.5%), egg rolls (5.8%), plantain chips (2.6%), buns (3.2%), sausage rolls (2.6%), soft drinks (5.8%) and yoghurts. (5.8%).

Table 3 Frequency for each type of snacks between meals

Type of snacks	Percentage of snack intake frequency (%)				
	Never	1-2 times	3-4 times	5-6 times	Everyday
<b>Foods</b>					
Fresh fruits	9.6	38.5	31.4		
Doughnuts	32.1	43.6	14.7	7.1	13.5
Egg rolls	41.0	35.3	14.1	5.1	4.5
Plantain chips	33.3	49.4	10.3	3.8	5.8
Buns	34.6	40.4	17.3	4.5	2.6
Sausage roll	26.9	39.1	27.6	4.5	3.2
<b>Beverages</b>					
Soft drinks	25.6	48.7	14.1	5.8	5.8
Yoghurts	25.6	48.7	14.1	5.8	5.8

#### 4.3 Meal and snacking patterns

In the study, the meals of the respondents were grouped into six patterns (Table 4). The most common meal and snacking pattern in this study was the three meals inclusive of two snacks (3M + 2S). followed by three meals plus one snack (3M + 1S). The percentage of respondents consuming three meals without snacking was the lowest.

Table 4: Meal and Snacking Pattern

Meal and snacking pattern	No of respondents (N=100)	Percentage (%)
3M + 3S	25	25%
3M + 2S	20	20%
3M + 1S	19	19%
3M	16	15%
≤ 2M + 2, 3S	12	12%
≤ 2M + 0, 1S	8	8%

3M: three main meals, 2M: two main meals, S: snacks

Association between meal and snacking patterns, energy and nutrient intakes

The mean daily energy intake was 1454 meal, and the protein, fat and carbohydrate intake were 56.6g, 200g and 50g respectively. Table 5 shows the energy and nutrient intakes according to the meals and snacking frequency.

3M: three meals, 2M: two main meals, S: snack

Protein intakes of all three meals with snacks (3M +3S, 3M + 2S and 3M+1S) were higher than those of meals pattern without snacking (3M and the meal skippers (≤2M+2,3S and ≤2M+0, 1S) (P<0.05). carbohydrates intakes in the “3M + 3S” and “3M + 2S” were the highest and were significantly different from those of “3M”, “≤2M + 2, 3S and “≤2M + 0,1S” (P<0.05).

Fat intake in the “3M +3S” was the highest and was significantly different from all other meal patterns except “3M + 2S” (P<0.05).

Table 5: Energy and nutrient intakes according to the meal and snacking pattern

Energy and nutrient intake	3M +3S (n = 25)	3M + 2S (n=20)	3M + 1S (n = 19)	3M (n = 16)	≤ 2M + 2,3S (n = 12)	≤ 2M+0,1S (n = 8)
Energy (Kcal)	1940± 211	1683±356	1587±326	1305±326	1314±225	1240±152
Protein (g)	69.7±11.4	63.7±16.9	62.1±16.2	48.7±14.8	39.7±11.4	44.5±13.4
Carbohydrate (g)	158.9±39.5	153.7±62.6	125.2±54.1	167.0±30.0	100.2±40.8	158.1±33.7
Fat (g)	56.7±11.4	54.3±11.2	45.3±10.2	37.1±10.0	36.4±10.0	40.0±10.9
Calcium (mg)	602.8±277.3	463.9±199.7	375.3±370.6	217.0±150.7	275.2±172.9	229.3±125.7
Iron (mg)	10.3±6.1	12.3±10.3	10.6±10.0	12.3±10.1	10.2±10.6	10.9±10.6
Sodium (ug)	2097.5±886.2	2018.5±554.2	2095.9±1230.3	2227. ±1027.3	1624.9±89.5	2002.5±785.3
Vitamin A (MgRE)	832.9±349.4	888.2±554.2	671.0±387.1	723.1±322.9	652.3±466.4	835.3±696.5
Thiamine (Mg)	0.8 ±0.3	0.8±0.3	0.7±0.3	0.5±0.2	0.5±0.2	0.4±0.2
Riboflavin (Mg)	2.1±1.1	1.7±0.9	1.4±1.3	0.8±0.2	0.6±0.2	1.1±0.8
Niacin (mgNE)	12.3±4.3	14.5±7.3	11.9±4.3	8.3±4.2	10.1±8.9	7.86±3.7
Vitamin C (mg)	65.5±73.3	69.9±71.8	49.4±62.7	35.2±45.4	102.2±120.4	35.8±39.6

#### 4.4 Findings

The findings from the study established that the highest mean of BMI were observed among the meal skippers with less frequent snacking (≤ 2M+0,1S), 20.5±3.6kg/m<sup>2</sup>. This was followed by the meal pattern which consist of three main meals and two snacks (3M + 2S), 20.3 ± 4.6 kg/ /m<sup>2</sup>. The lowest mean of BMI was observed in the meal pattern of three main meals without snacking (3M), which is 18.5 ± 3.2kg/m<sup>2</sup>. The result of the ANOVA shows there is no significant difference in BMI between meal and snacking patterns.

#### 5 Conclusion

The consumption of snack patterns involved in this study focused on the meals and snacking patterns among the in- school adolescents and revealed that majority of them (25%) consumed three main meals and three snacks each day. The most frequently consumed snacks included fresh fruits, doughnuts, egg rolls, plantain chips, buns, sausage roll, soft drinks and yoghurts.

The more snacks consumption increase, the higher the energy intake. This implies more carbohydrate intake from snacks as compared to protein and fat intake. From the study carried out, there was no significant association between snacking patterns have more effects on energy and nutrient intakes, but no relation with BMI among the junior secondary school students. However, snack food choices remain a concern and hence the consumption of fresh fruits and vegetables should be encouraged.

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