

Original Research Article

Snack consumption pattern of adults in the University of Calabar and its health implications

ABSTRACT

Aims: To determine the snack consumption pattern of adults in University of Calabar and the effect of consumption of certain snacks on their health status.

Study design: Cross-sectional survey.

Place and Duration of Study: University of Calabar, Calabar - Nigeria. June to July, 2017.

Methodology: After a multi-staged random sampling technique, a cross-sectional survey was carried out on 400 adult respondents using a well-structured questionnaire. Food frequency questionnaire (FFQ) and 24hour dietary recall were also administered to the respondents. The data obtained from the survey instruments were analysed with the aid of Microsoft excel. For the dietary intake assessment, Food and Agricultural Organisation's (FAO) 'Guidelines for Measuring Household and Individual Dietary Diversity' was used to calculate individual's dietary diversity score (DDS) before recording.

Results: It was observed that 84% of the respondents skipped meals and breakfast was the most skipped meal followed by lunch. Most people (46%) skipped breakfast because they left early for work while majority who skipped lunch did so because they had no time for food at work (53%). Only 8.6% of the respondents did not eat snacks, and most of those who consumed snacks did so because they preferred snacks to food (32%). The most commonly consumed snacks among the respondents was pastries (36.5%), followed by biscuits (25.7%) while the least consumed snacks were vegetables (1%) followed by sweets and gums (1.1%). Consequently, pastries contributed the most snack calories to the study population.

Conclusion: Most people skipped meals; and snacks served as a substitute for such skipped meals. Only few people frequently consumed healthy snacks such as fruits and vegetables. Most people were discovered to eat pastries as snacks and these pastries (such as cakes and pies) are highly processed foods which could increase the risk of non-communicable diseases (NCDs) in their consumers.

Keywords: snacks, adults, consumption, meals

1. INTRODUCTION

Snacks can be said to be any light food eaten in-between the three main meals – breakfast, lunch and dinner [1]. Nowadays, soft drinks are one of the most common snack choices among young adults [2] followed by pastries. The choice of snacks in most adults is based mainly on taste rather than nutrition, resulting in the tendency to choose salty, high-sugar or high-fat foods as snacks instead of healthier alternatives such as fruits and vegetables [3].

23 Some of these high-sugar and high-fat snacks have been reported to be responsible for the
24 increase in the incidence and prevalence of some diet-related disease conditions such as
25 obesity, diabetes and hypertension [4]. Reports from past studies suggests that men and
26 women who are obese snack more frequently than weight men and women[5].The results
27 from a study carried out at an elementary school in Philippines, show that those who
28 snacked the most were more than twice as likely to be overweight compared to those who
29 consumed the fewest snacks [6]. On the other hand, small controlled studies from Canada
30 and Iran found that healthy snacking can lead to lower levels of cholesterol, triglycerides,
31 and lower density lipoproteins, and higher levels of high-density lipoproteins[7,8]. Some
32 foods are considered healthy depending on their nutrient content while others are
33 considered unhealthy [9]. Healthy diets (including both meals and snacks) are essential for
34 maintaining good health and preventing diseases.

Comment [p1]: This is not clear – clarify what you mean

Comment [R02]: Sorry 'normal' weight

35 As the world becomes more industrialized, there is increase in the consumption of 'fastfoods'
36 which are most times 'junk food' because they are not so nutritious and may lead to
37 diseases when consumed frequently [8]. This is due to the fact that people now spend a lot
38 of time at work and many do not have enough time to cook nutritious foods at home, so they
39 just grab whatever foods/snacks they can find in the course of the day. This development, in
40 addition to reduced physical activity, has led to an increase in the prevalence of diet-related
41 diseases such as obesity and diabetes [8].

Comment [p3]: Insert a reference

Comment [R04]: Ok

Comment [p5]: Insert a reference

Comment [R06]: Ok

42 It is important that people, particularly adults, become aware of the health consequences of
43 their snack/food choices. This will make them better informed and enable them choose
44 healthier snack alternatives that will at the same time boost their immunity to disease while
45 supplying them with the necessary energy to do work. Fruits such as watermelons, oranges,
46 cucumbers and sugarcanes are also very good hydrants that can replace the consumption of
47 fizzy drinks which lack essential nutrients [10]. These fruits/vegetables may also be made
48 into salads, smoothies or even juiced for easy consumption.

49 With the increase in malnutrition and prevalence of non-communicable diseases (NCDs)
50 worldwide, it has become necessary to study the aetiology of growing number of diet-related
51 diseases which populations are being faced with, in a bid to proffer solutions. Dietary
52 adjustments/modifications have also become quite popular and effective in the treatment
53 and management of non-communicable diseases [4]. Proper nutrition education is also
54 needed especially in rural or semi-urban areas in order to enlighten the people on how to
55 make healthy food choices that will prevent disease and maintain health.

Comment [p7]: A reference is needed here

Comment [R08]: The reference is at the end of the sentence below

56 This study therefore, seeks to determine the snacking choices of the study population, and
57 to ascertain the ~~effect influence~~ of dietary consumption of fats and sugar from snacks on
58 their health status. It also seeks to evaluate the contribution of some frequently consumed
59 snacks to the dietary intake of the studye population.

Comment [p9]: Influence could be replaced with effect

Comment [R010]: Alright

60 61 2. METHODOLOGY

62 63 2.1 Consumption survey and Dietary assessment

64 2.1.1 Area of study

65 The study was carried out in University of Calabar, Calabar in Cross River State. From the
66 records available at the University's Registry, the current student population stands at about
67 40,000, while the staff are about 3,000 bringing the total population to about 43,000. The
68 University community is comprised of people from different ethnic groups in Nigeria and

Comment [p11]: This statement should be rephrased. It could be "The records available at the University's Registry showed the current student population as 40,000 and staff as 3,000 bringing the total population as 43,000.

Comment [R012]: Thank you

69 other nationalities like Cameroun, Ghana and Liberia; but the predominant tribes are the
70 Efiks, Ibibios and Ibos.

71

72 2.1.2 Population of the study

73 The population for this cross-sectional study consisted of the 3,000 staff- (men and women)
74 within the ages of range of 25 to 65 years, working at the University of Calabar, Calabar.

75 2.1.3 Sample size determination

76 This was calculated using Cochran's formula as recorded by (Bartlette *et al.* insert the
77 reference number, 2004) as shown below:

$$78 n = \frac{t^2 \times p(1-p)}{m^2}$$

79 n = required sample size

80 t = confidence level at 95% (standard value of 1.96)

81 p = estimated prevalence of hyperlipidaemia in the area

82 m = margin of error at 5% (standard value of 0.05)

83

84

85 According to a recent study by Akpa *et al.* (2006) carried out in Port Harcourt (South-South,
86 Nigeria), the prevalence of hyperlipidaemia was 31.5%.

$$87 n = \frac{1.96^2 \times 0.315(1 - 0.315)}{0.05^2} = 332$$

88

89 The sample size was increased by 20% to make room for contingencies like dropouts, non-
90 responses or incorrectly-filled questionnaires. Thus, That is, 332 + 66 = 398. This was then
91 rounded up to 400 adults.

92 2.1.4 Sampling procedure

93 A two-stage sampling technique was employed for selecting the sample of the study. In the
94 first stage, University of Calabar was stratified into the 10 Faculties, 3 Institutes, Bursary,
95 Registry and Vice Chancellor's office (16 sample clusters in all). A list of staff in each of the
96 16 sample clusters was obtained (sampling frame). In the case of Faculties, the staff list
97 was obtained from the various Departments. In the second stage, a number of participants
98 proportional to the size of each cluster ~~waswere~~ randomly selected for the study.

99 2.1.4.1 Exclusion criteria: Participants who did not meet the desired sample criteria- those
100 who were chronically ill, diabetic, hypertensive patients, pregnant and lactating mothers,
101 were dropped from the study (particularly the detailed dietary assessment) and replaced by
102 others in the same sample cluster. The health status of the participants was determined by
103 observation and interaction, during which medical history was taken.

104 2.1.4.2 Ethical approval: Appropriate ethical approval was obtained from the University of
105 Calabar Teaching Hospital (UCTH) for this research work.

106

107 2.1.4.3 Informed consent: An informed consent form was designed containing information
108 on this research. The participants were made to read and then sign the informed consent
109 form to formally indicate their consent to participate in this study.

Comment [p13]: This reference format did not follow the Journal format of in-text reference; the date should not reflect

Comment [p14]: Indicate the prevalence here

Comment [R015]: Done

Comment [p16]: A reference of 2006 cannot be said to be recent study.

Comment [R017]: Ok

Comment [p18]: Follow the same suggested correction in comment p7

Comment [R019]: Alright

Comment [p20]: What do you mean? Explain what you actually did

110
111 2.1.4.4 Questionnaire design and administration: A semi-structured questionnaire was
112 designed to gather information from the 400 participants who had read and signed the
113 consent form. The questionnaire was structured to gather socio-economic data, medical
114 history, information on dietary intake (including egg consumption pattern) and lifestyle of the
115 participants. A food frequency questionnaire and 24 hour dietary recall form were also
116 used attached. The questionnaires were filled mostly by interviewer-administered pattern (in
117 order to minimize errors) except in some cases where the respondents were literate enough
118 to complete them.

119 120 2.1.5 Dietary intake using 24 hour dietary recall

121 Gibson [11] multi-pass method was used for the food intake assessment. A detailed follow-
122 up study was then conducted for a week on 50 participants selected from the 400
123 respondents respondents based on their egg consumption pattern. The 24 hour dietary
124 recall was used again and repeated on three different days. Different sizes of solid materials
125 and pictures from food model materials, were used in order to increase the accuracy of
126 meat, fish, fruits and other foods quantification [11]. The weight of the foods consumed were
127 converted into nutrients and calories by the use of the West African Food Composition Table
128 [12]. Special attention was paid to calculating cholesterol content of the foods consumed and
129 the dietary intake of cholesterol by the participants.

130 2.2 Data analysis

131 In the questionnaire analysis, after coding, data was entered into the computer and also
132 analysed using Microsoft Excel 2013 spreadsheets and SPSS version 20.0. Descriptive
133 statistics such as frequencies, percentages, graphs and charts were used to present the
134 results of the questionnaire analysis. With the use of linear correlation and Chi square, data
135 from the questionnaire (medical history and lifestyle sections) were compared with snack
136 consumption.

137 138 3. RESULTS AND DISCUSSION

139 140 3.1 Food consumption and snacking habits

141 Table 1 shows the food consumption and the snack consumption pattern of the respondents
142 including the various reasons for skipping meals. Approximately 85% of the respondents ate
143 between two to three meals per day. Only a small fraction (4.5%) of the study population
144 bought all their meals; most of the respondents (60%) both cooked some and bought some
145 meals. Majority of the respondents (84%) skipped meals and the most frequently skipped
146 meal was breakfast (46%). The most frequent reason given for skipping breakfast was 'early
147 departure for work' (45.9%), while that of lunch was 'no time at work' (52.9%) and that of
148 dinner was 'weight watching' (34.9%). Many respondents (91%) consumed one kind of
149 snack or the other; most of them consumed snacks simply because it was preferred to food
150 at certain times (32.1%), others because there was no time at work (28.2%), no cooked food
151 available (22.5%) or due to weight watching (14%). The most consumed snack was pastries
152 such as meat pies (36.5%), followed by biscuits (25.7%) and fruits (19.6%).

153 University of Calabar is an enlightened community, with most people being aware of health
154 risk factors causing them to eat healthy and exercise regularly. This was also reflected in the
155 dietary diversity scores (DDS) obtained from the 24 hour food recall, where up to 60% of the
156 respondents had medium DDS while 32% had a high DDS. Only very few had low DDS.

Comment [p21]: This is not clear. Is the egg consumption pattern a criteria for assessing dietary intake?

Comment [RO22]: No pls. Sorry this section doesnt belong here

Comment [p23]: This information is not included anywhere in the result. Concentrate only on the aspect of the study reflected in your topic

Comment [RO24]: I have deleted this section in the MS doc

Comment [p25]: Is this part of consumption of snacks? Which foods are you talking about? There is a lot of mix-up

Comment [RO26]: Sorry about that

Comment [p27]: This is missing in the result

Comment [p28]: Was the DDS only for snacks? Some of your presentations are hanging and does not give your reader full information on what you intend to pass across

157 Education and awareness go a long way in informing people of the need for consuming
 158 healthy snacks and diets and for healthy feeding practices, especially as a person ages. This
 159 enables people make enlightened snack/food choices. Some people are not able to make
 160 the right snack/food choices as a result of the work environment or unavailability of healthy
 161 choices at work, hence they consume soda drinks and fried snacks just to assuage their
 162 hunger when at work. Most of these drinks are sugar dense while the fried snacks are high
 163 in trans fats, saturated fats and cholesterol. These could predispose their consumers to
 164 some of the diet-related NCDs such as hypertension, stroke, diabetes and obesity [13].

Comment [p30]: This point should be substantiated by a literature support

Comment [p31]: Did you analyze the foods as to give this assertion?

Comment [R032]: No. But they have nutritional labels

165

166 **Table 1. Food Consumption and Snacking habits**

Variable	Responses	Frequency (N)	%
Frequency of daily food intake	Once	16	4.0
	Twice	189	47.5
	Three times	188	47.2
	More than three times	5	1.3
	Total	398	100
Skip meals	Yes	330	84
	No	63	16
	Total	393	100
Meals skipped	Breakfast	148	41.0
	Lunch	110	30.5
	Dinner	13	3.6
	All meals	58	16.1
	Breakfast & Dinner	12	3.3
	Breakfast & Lunch	20	5.5
	Total	361	100
Breakfast	Reason for skipping meal:		
	Early departure for work	107	45.9
	Lack of time	44	18.9
	No appetite	55	23.6
	Weight watch	14	6.0
	Fasting	13	5.6
Total	233	100	
Lunch	No cooked food available	28	14.7
	No time at work	101	52.9
	Preference of snack to food	17	8.9
	Watching weight	28	14.7
	Others	17	8.8
Total	191	100	
Dinner	Close late at work	21	25.3
	Too tired to cook	17	20.5

	Desire to be alert & work at night	4	4.8
	Watch weight	29	34.9
	Others	12	14.5
	Total	83	100
Eats snack	Yes	373	91.4
	No	24	8.6
	Total	397	100
Reasons for eating snacks	No cooked food available	82	22.5
	No time at work	103	28.2
	Preference to food	117	32.1
	Watch weight	51	14.0
	Others	12	3.2
	Total	365	100

167

168

169 3.2 Snack consumption pattern of respondents

170 | ~~From the analysis of the questionnaires,~~ figure 1 shows the snack consumption pattern of
 171 | the respondents in percentages. Pastries (such as meat pies, fish pies, doughnuts, eggrolls
 172 | and cakes) were the most frequently consumed snacks by most of the respondents (36.5%).
 173 | This was followed by biscuits (25.7%) and fruits (19.6%). Only very few respondents (1.0%)
 174 | had vegetables (such as carrots and pumpkin) as their most consumed snack; this was the
 175 | least frequently consumed snack followed by sweets and gums (1.1%).

176 | Pastries (such as cakes, pies and egg rolls) which were frequently consumed are usually
 177 | produced using flours, eggs, fats (such as margarine/butter and frying oils) and a lot of
 178 | sugar. Research has shown that these high-carbohydrate and high-fat food components
 179 | (which trigger hyperglycaemia and hyperlipidaemia), are some of the main culprits
 180 | responsible for many of the diet-related NCDs which have become increasingly prevalent in
 181 | many countries [14]. This fact, coupled with globalization and the sedentary lifestyles of
 182 | people, has brought about a lot of health challenges in recent times [7]. It was observed that
 183 | many of the people were overweight, hence it may be necessary for proper dietary
 184 | adjustment and healthy lifestyle changes in order to prevent obesity and also to reduce the
 185 | risk of diabetes mellitus which has become quite prevalent in the southern region of the
 186 | country [4].

187 | Detailed statistical analyses of the food frequency questionnaire also showed that over 50%
 188 | of the respondents ate pies at least once a week, over 60% ate fried snacks at least once a
 189 | week and up to 12% ate both pies and fried snacks over 3 times a week. It was also
 190 | observed that a good number of the respondents consumed other pastries such as burgers,
 191 | cookies and cakes quite frequently in a week (mostly about 3 times a week).

192 | This means that a large portion of these processed carbohydrate and fatty foods are
 193 | consumed on a weekly basis by the study population. In a similar study [15], it was also
 194 | observed that snacking more times in a day is associated with consuming more calories and
 195 | that the foods and beverages contributing the most calories at snacks are not the most
 196 | nutritious options. In their study [15], it was reported that alcoholic and sugar-sweetened

Comment [p33]: There should be a reference for this

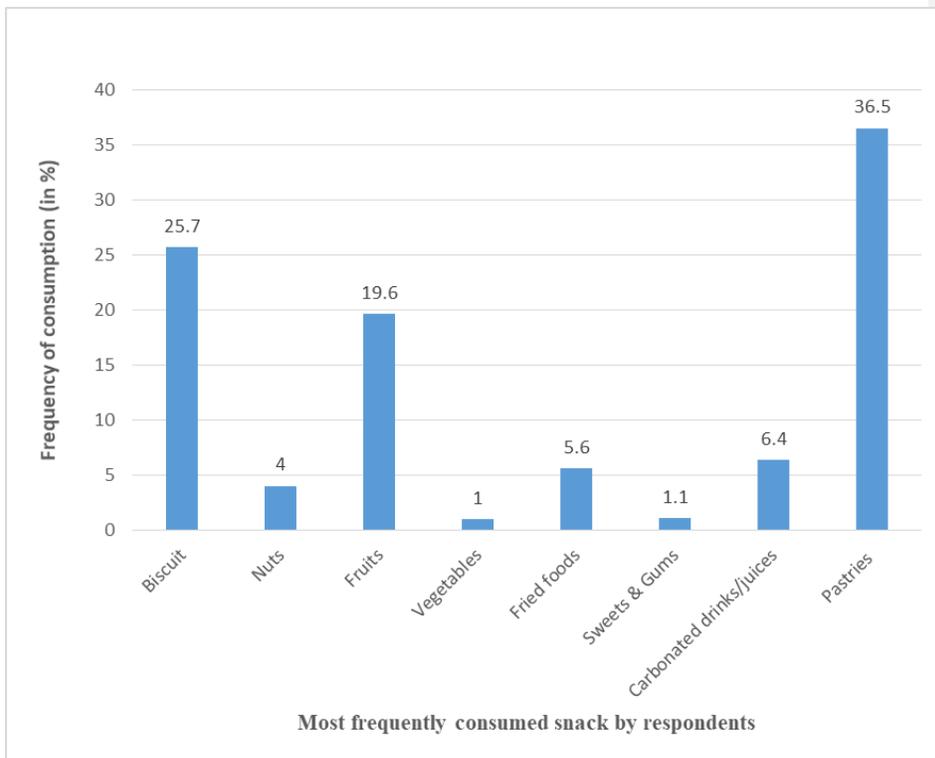
Comment [p34]: It is surprising that overweight can be assessed by observation. What observation tool did the author use for this assessment?

Comment [R035]: Anthropometric assessment wasn't part of this study but I just made that statement based on some respondents' physical appearance

197 beverages contributed the highest percentage of snack calories to that population. In this
198 study, it was pastries that contributed the most snack calories as it was most frequently
199 consumed by the respondents.

200

201 **Figure 1. Snack consumption pattern of respondents in percentages**



202
203

204 **4. CONCLUSION**

205

206 The results of the cross-sectional survey and the dietary intake assessment showed that
207 most people consumed a lot of pastries and soft drinks as snacks (making these the major
208 contributors of snack calories). Many people are yet to realize the health benefits of using
209 nutritious alternatives such as fruits and vegetables as snacks. There is the need for
210 enlightenment in the area of making healthy snack choices in order to achieve the necessary
211 dietary adjustments that will help in keeping adults energized and still reduce the risk of
212 diseases such as obesity and diabetes mellitus. This will go a long way in increasing
213 longevity, boosting productivity and reducing the prevalence of many non-communicable
214 diseases.

215

216 **COMPETING INTERESTS**

217

218 No competing interests exists.

219

220

221

222

223 **REFERENCES**

224

225 1. Bigler-Doughten, S. & Jenkins, R. M. (1987). Adolescent snacks: nutrient density and
226 nutritional contribution to total intake. *J Am Diet Assoc*, 87(12):1678-1679

227

228 2. Ludwig, D. S., Peterson, K. E., Gortmaker, S. L. (2001). Relation between consumption of
229 sugar-sweetened drinks and childhood obesity: a prospective, observational analysis.
230 *Lancet*, 357: 505-508.

231

232 3. Cross, A. T., Babicz, D. & Cushman, L. F. (1994). Snacking patterns among 1800 adults
and children. *J Am Diet Assoc.*, 94(12): 1398-1403.

233

234 4. Ezzati, M., Hoorn, S. V. & Rodgers, A. (2002). Comparative Risk Assessment
235 collaborating Group Estimates of global and regional potential health gains from reducing
multiple major health risk factors. *The Lancet* 362 (9380): 271-80.

236

237 5. Berteus, F.H., Torgerson, JS, Sjostrom, L., & Lindroos, A.K. (2005). Snacking frequency in
238 relation to energy intake and food choices in obese men and women compared to a
reference population. *International Journal of obesity*. 29(6):711-719.

239

240 6. Gonzalez-Suarez, C.B., Lee-Pineda, K., Caralipio, N.D., Grimmer-Somers, K., Sibung,
241 E.O., & Velasco, Z.F.(2015). Is what Filipino children eat between meals associated with
body mass index? *Asia Pac J Public health*, 27(2):NP650-61.

242

243 7. Jenkins, D. J., Khan, A., Jenkins, A. L., Illingworth, R., Pappu, A. S., *et al.* (1995). Effect
244 of nibbling versus gorging on cardiovascular risk factors: serum uric acid and blood lipids.
Metabolism, 44(4): 549-555.

245

246 8. Rashidi M. R., Mahboob, S. & Sattarivand, R. (2003). Effects of nibbling and gorging on
247 lipids profiles, blood glucose and insulin levels in healthy subjects. *Saudi J Med*, 24(9): 945-
948.

Comment [p36]: The author/authors should use the Journal format for references as well as be consistent in the presentation of the Journal names. Some are written in full while others are abbreviated. Be consistent.

Comment [R037]: Noted. Adjusted in the main work

Formatted: Font: Italic

- 248 9. FAO (2013). Combating Micronutrient Deficiencies: Food-based Approaches. The Food
249 and Agriculture Organization of the United Nations. Eds B. Thompson and L. Amoroso).
- 250 10. Williams, I. O., Onyenweaku, E. O. & Atanghwo, I. J. (2016). Nutritional and
251 antimicrobial evaluation of *Saccharum officinarum* consumed in Calabar, Nigeria. *African*
252 *Journal of Biotechnology*. Vol. 15 (33): 1789 – 1795.
- 253 11. Gibson, R. S. (2005). Principles of Nutritional Assessment (2nd ed.). New York, New
254 York: Oxford University Press.
- 255 12. FAO (2012). West African Food Composition Table. Food and Agriculture Organisation
256 of the United Nations. Rome, Italy.
- 257 13. Onyenweaku, E. O., Ene-Obong, H. N., Oko, G. E. & Williams, I. O. (2019). Contribution
258 of Eggs and Other Cholesterol-containing Foods to Total Dietary Cholesterol intake, and
259 Their Influence on Serum Lipid Profile of Adults in Calabar, Nigeria. *European Journal of*
260 *Nutrition & Food Safety*, Vol. 9 (4): 329 – 340.
- 261 14. Opadijo, O. G., Akande, A. A., & Jimoh, A. K. (2004). Prevalence of Coronary Heart
262 Disease risk factors in Nigerians with systemic hypertension. *African Journal of Medical*
263 *Sciences*, 33(2): 121-125.
- 264 15. Sebastian, R. N., Wikinson, E. C. & Goldman, J. D. (2011). Snacking Patterns of US
265 Adults: What we eat in America, NHANES 2007-2008. Food Surveys Research Group
266 Dietary Data Brief No. 4. June 2011. Available at:
267 <http://ars.usda.gov/Services/docs.htm?docid=19476>.
- 268