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Association Between Breakfast Consumption and Anthropometrically Determined Nutritional Status of Secondary-School Adolescents in Lagos, Southwest Nigeria

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ABSTRACT

Background and Objectives: Breakfast skipping has been associated with obesity among adolescents in some studies but little is known about the relationship between breakfast consumption and obesity among secondary-school adolescents in Nigeria. This study contributes to the empirical literature by analyzing the relationship between breakfast consumption and anthropometrically determined nutritional status of secondary-school adolescents in Lagos, Nigeria.

Methods: This was a descriptive cross-sectional study in which multi-stage sampling was used to select 397 secondary-school adolescents (10 to 19 years, mean = 13.8 ± 1.7 years). They were classified into student groups from public or private schools in Lagos. Data were collected using a semi-structured self-administered questionnaire and analyzed using Epi-info version 7. The independent variables were the proportion of adolescents who had a high level of knowledge about breakfast consumption, while the outcome variable was the proportion of adolescents who were overweight or obese. World Health Organization (WHO) AnthroPlus software was used to determine the nutritional status of adolescents. Mean and standard deviations were computed for continuous variables, and frequency tables were generated for categorical variables. Significant associations between variables were obtained using Chi-square with the level of significance set at $p < 0.05$.

Results: Only 17% of the adolescents had good knowledge of breakfast consumption. More than half (57.4%) of the participants ate a daily breakfast. The percentage of adolescents who skipped breakfast was higher among older 16-19 years (52.2%) and middle 13-15 years (43%) than the younger adolescents (34.7%). Girls skipped breakfast more than boys. Most respondents were in the normal Body Mass Index (BMI) ranges for their genders. Prevalence of overweight and obesity were 7.1% and 3.3% among males and 7.1% and 2.8% among females respectively. The mean BMI of those who skipped breakfast (19.33 ± 3.27kg/m^2) was significantly higher than the BMI of those who ate breakfast (18.56 ± 3.05 kg/m^2) (p=0.019). Most of the adolescents who ate a daily breakfast had mothers who had completed only primary school education although the relationship was not statistically significant (χ^2 =5, p=0.172).

Conclusion and Global Health Implications: Breakfast knowledge was low, while breakfast consumption was average. Adolescents who skipped breakfast had a significantly higher BMI (19.33 ± 3.27kg/m^2) than those who ate breakfast (18.56 ± 3.05 kg/m^2) (p=0.019). Nutrition education that emphasizes the importance of breakfast consumption with the purpose of behavioral change should be intensified among adolescents.

Keywords: • Breakfast • Consumption • Knowledge • Nutritional Status • Overweight • Obesity

1. Introduction

1.1. Background of the Study

Adolescents, according to the World Health Organization (WHO) refer to children between the ages of 10 and 19 years, and this period is characterized by rapid growth in physical and emotional development.[1] At this stage, significant energy is needed for growth, and the majority of this energy can only be derived from eating healthy meals at the appropriate time. Food habits formed during this time will have a long-term effect on the adolescent's lifestyle and eating habits in adult life.[2,3] Breakfast is the first meal of the day, especially when taken in the morning. It is the most essential meal of the day and should include food groups, such as fruits and vegetables, whole grains, and sources of calcium such as milk.[4,5,6] Some studies have shown that breakfast skipping is associated with obesity, while others have reported its association with reduction in the intake of essential nutrients among adolescents.[7,8]

There is a high global prevalence of breakfast skipping among children and adolescents.[5] A national survey among Canadian adolescents revealed that 48.5% of the adolescents who participated in the study skipped breakfast.[3] Others have reported an increasing trend of breakfast skipping with an increase in age, such that this habit was more prevalent in the older adolescents. This trend was documented in Greece where 14.1% of girls and 9.8% of boys between the ages of 13 and 14 years who skipped breakfast compared to 18.7% of girls and 17.2% of between the ages of 17 and 19 years who skipped breakfast.[6] A study conducted in four secondary schools (south of Netherlands) observed that 2.5% of the students skipped breakfast on all school days, and 14.0% skipped breakfast on some days of the school week. Therefore, the total number of students who skipped breakfast was 16.5%, which was much lower than what was observed in Canada.[9]

Breakfast consumption and skipping have been observed to differ among gender. In studies conducted in Jordan and Malaysia, 52.3% and 56.3% of the participants had breakfast prior to school resumption, and the majority of these were boys.[2,9] In a study among girls attending an urban secondary school in Benin City, Nigeria, a significant proportion, 46.3%, of the girls skipped breakfast.[10]

Reasons, why adolescents skip breakfast, include not waking up early, weight loss, and weight control intentions, and some adolescents claim not to feel hungry in the mornings.[10-15] Adolescents who skip breakfast are encouraged to snack on foods rich in high fat later in the day when they become more hungry, and this may lead to higher levels of cholesterol, obesity, and their associated complications, namely hypertension, diabetes, and other non-communicable diseases later in life.[5,6,13,15] However, those who eat breakfast have an increased level of activity[11] and therefore, have a high energy output, which helps them maintain a healthy Body Mass Index (BMI).

Studies have shown that frequent breakfast consumption improves the daily dietary intake of essential nutrients required for the day's activities in children and adolescents.[2,6] Additionally, it has been shown that children and adolescents who frequently consume a breakfast have an improvement in quality of life, regular school attendance, increased academic achievements, positive psychosocial functioning, and an increased level of physical activity.[5,6] Daily intake of breakfast has also been associated with a reduction in the risk of cardiovascular diseases, obesity, and a reduced rate of gastrointestinal disturbances.[2]

Despite the evidence supporting the importance of breakfast consumption, most adolescents still skip breakfast. Adolescence is the period of transition to adulthood and and a significant amount of energy is needed for growth, and most of this energy is received from breakfast.[2] In Nigeria, there is still a paucity of studies on breakfast consumption and breakfast skipping among adolescents. In a study conducted in Benin City, Nigeria, almost half of adolescents skipped breakfast daily, while in in another study in Lagos, an association between breakfast skipping and academic performance was observed.[9,12] However, little is known about the relationship between breakfast skipping and the prevalence of obesity among secondary-school adolescents in Lagos State, Southwest Nigeria.

1.2. Objectives of the Study

The objective of this study was to determine the relationship between breakfast skipping and the prevalence of obesity among secondary-school adolescents in Lagos State. The study aims were to determine the following: (1) the level of knowledge about the importance of breakfast consumption, (2) breakfast consumption habits, (3) nutritional status (based on BMI), and (4) the relationship between breakfast skipping and prevalence of obesity.

2. Methods

2.1. Study Variables

This was a descriptive, cross-sectional study among secondary-school adolescents in Lagos State, Southwest Nigeria. The minimum sample size was determined using Cochran's formula (where p was 36% from the prevalence of malnutrition in a Nigerian study, which was 390[13]; however, a higher sample of 397 was used). The independent variables were adolescents' knowledge on the importance of eating breakfast and daily consumption of breakfast, while the outcome variable was the prevalence of obesity among them.

2.2. Study Population

A multi-stage sampling method was used to collect data from secondary-school adolescents. One urban (Alimosho) and one rural Local Government Areas (LGA) (Ikorodu) were selected from the 20 LGAs in Lagos State using a simple random sampling technique.

Thereafter, one public and one private secondary school were selected from the list of private and public secondary schools in Alimosho and Ikorodu LGAs. Four classes were included in the study from each school, and they were junior secondary (JS; 1 and 2) and senior secondary (1 and 2) classes, giving a total of 16 classes. One arm from each class (each class had many arms, such as JS 1A, JS 1B, and JS 1C), which was selected, and all the students were interviewed.

2.3. Data Collection Tools and Techniques

A semi-structured, interviewer-administered questionnaire pertaining to knowledge on the importance of breakfast, breakfast-eating habits, and nutritional status (assessed as BMI) was used. The questionnaire was adapted from Breakfast Survey, developed by Cumbria County Council for National Health Service (NHS).[14,15] The questionnaire was divided into four sections. The first section contained questions on socio-demographic data while the second section was on breakfast-consumption knowledge. The third section contained questions on breakfast consumption habits while the fourth section contained questions on nutritional status.

Anthropometric measurement (weight and height) of students was used to assess the nutritional status of respondents. The anthropometric measurements were made using the standard technique as described by Gibson.[16] BMI was calculated by dividing the weights in kilograms by the square of their heights (m^2). Age and gender-specific BMI cut-off points were used to classify respondents as underweight, normal weight, overweight or obese using WHO Anthroplus.[17]

A pretest study was performed among 20 secondary-school adolescents in Mushin LGA. Two research assistants were trained on the content and administration of the questionnaire by the researchers. They were tested, and they passed the test before they were engaged in data collection to ensure quality control. Some questions that seemed ambiguous to the respondents were modified during the pretest before administering the questionnaire.

2.4 Statistical Analysis

All data collected were analyzed using the Epi-info version 7.[18] Mean and standard deviations were computed for continuous variables such as age, and frequency tables were generated for categorical variables such as level of knowledge and breakfast consumption habits. Associations between breakfast consumption habits and nutritional status were determined using Chi-square with the level of significance set at $p< 0.05$. There were 41 questions knowledge; the respondents were scored by assigning one mark to each of the correctly answered questions and zero to the wrong answers. This was a 41 (100%) point knowledge score. Those who scored less than 40% had poor knowledge, 40-60% had fair knowledge and 60% and above had good knowledge.

2.5. Ethical Approval

Ethical approval was obtained from the Health Research and Ethics Committee of Lagos University Teaching Hospital (HREC approval number is ADM/DCST/HREC/APP/304).

3. Results

3.1. Sociodemographic Characteristics

Three hundred and ninety-seven secondary-school students (211 girls, 53.2% and 186, 46.8% boys) were interviewed. Their ages ranged from 10 to 19 years, with a mean of 13.8 ± 1.7 years. The majority of the students (81.1%) lived with both parents; almost half of the mothers (48.2%) and the majority of the fathers (60.8%) were educated beyond secondary school level. Most of those who ate a daily breakfast had mothers who had completed only primary school education, but this relationship was not statistically significant (x^2 =5, p=0.172).

3.2. Breakfast Consumption Knowledge and Habits

Out of the total number of respondents, the majority (83.9%) understood the definition of breakfast as the first meal of the day. The majority (60.0%) of respondents knew that skipping breakfast could result in a reduced level of physical activities but only a few of the respondents (17.6%) had overall good knowledge on the importance of eating breakfast (Table 1).

About 56.7% of the respondents ate a daily breakfast; the majority (80.9%) ate breakfast the day before the data collection, and most (84.7%) ate their breakfast at home, while 13.4% ate it in school. The most common foods that were consumed as breakfast were bread and egg, followed by cereals and milk. The most common reasons for not eating breakfast included limited time (38.5%) or not feeling hungry (25.9%) in the mornings.

Packaged breakfast cereals, such as corn flakes and raw cereals (e.g., rice) were daily consumed by 21.9% and 21.1% of adolescents, respectively. Roots and tubers were rarely eaten as breakfast foods by respondents. The most frequently consumed root and tubers were cassava/garri and plantain (eaten daily; 8.1% and 7.3%, respectively). One-quarter of respondents drank milk, while 18.9% daily ate fruits (Table 2).

3.3. Nutritional Status of the Adolescents

The majority (77.2% male and 85.3% female) of the adolescents were within the normal range of BMI**.** Prevalence of underweight was 11.3% and 4.3% among males and females, respectively, while the prevalence of overweight adolescents and obesity were 7.1% & 3.3% among males; 7.1% and 2.8% among females (Figure 1).

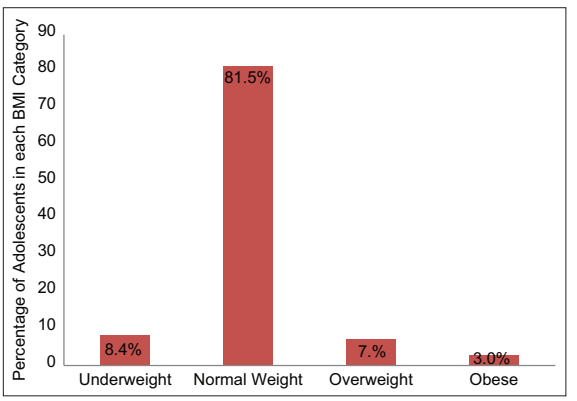

Figure 1: Nutritional status of secondary-school adolescents in Lagos State
(Underweight: BMI<18.5kg/m^2; Normal Weight: BMI= 18.5- 24.9 kg/m^2; Pre-obesity: BMI=25.0–29.9kg/m^2; Obesity class I: BMI=30.0- 34.9 kg/m^2; Obesity class II: BMI= 35.0-39.9 kg/m^2; Obesity class III: BMI>=40 kg/m^2)[29]

Table 1: Knowledge about breakfast consumption and its effects

Knowledge about breakfast	Frequency	Percentage (%)
Breakfast as the first meal of the day	276	83.9
Best food for breakfast is a light liquid food	355	94.9
Eating breakfast prevents obesity	293	88.3
High-quality breakfast consists of many food groups	254	69.2
Type of food best taken as breakfast (multiple responses allowed)		
Coffee	224	56.4
Fruit or vegetable juice	135	34
Cereals	201	50.6
Pap & Moimoi	191	48.1
Fruits and vegetables	109	27.5
Eba and vegetables	27	6.8
Pizza & ice-cream	66	16.6
Soft drink & gala	77	19.4
Bread & butter	310	78.1
Benefits of eating proper breakfast (multiple responses allowed)		
Supplies energy	353	88.9
Improving attention span, and problem-solving ability	169	42.6
Increases academic performance	202	50.9
Better sleep duration later in the night	70	17.6
Enhances good mood	176	44.3
Keeps one healthy	314	79.1
Helps one try new foods	54	13.6
Establishing healthy eating habits/lifestyle	164	41.3
Getting important nutrients, vitamins, and minerals	237	59.7
Reduces absence and lateness	58	14.6
Increase physical activity	207	52.1
Maintain or reach a healthy weight	205	51.6
Enhances getting along with others	86	21.7
Disadvantages of not eating breakfast (multiple responses allowed)		
Increased soft drink consumption	57	14.4
Increased snacking	90	22.7
Reduced level of physical activity	238	60
Stress	114	28.7
Health problems that can result from skipping breakfast (multiple responses allowed)		
Overweight & obesity	158	39.8
Increased risk of developing type 2 diabetes	112	28.2
Increased risk of developing cancer	110	27.7
Affects cognitive functioning	161	40.6
Overall level of Knowledge	**Frequency**	**Percentage (%)**
Good	70	17.6
Fair	201	50.6
Poor	126	31.8
Total	397	100

Table 2: Respondent's breakfast consumption habits

Breakfast Habits	Frequency	Percentage)
Eats breakfast every day	225	56.7
Frequency of breakfast among others		
1 or 2 days per week	30	17.5
3 or 4 days per week	45	26.1
5 or 6 days per week	97	56.4
Ate breakfast yesterday		
Yes	321	80.9
No	76	19.1
Where breakfast was taken (among those who ate breakfast the previous day		
At home	272	84.7
In the car	4	1.2
In the bus	2	0.6
At school	43	13.4
Food eaten as breakfast		
Bread and egg	123.6	38.5
Cereal and milk	60.7	18.9
Rice and meat	59.7	18.6
Beans and plantain	17	5.3
Fruit or Fruit Juice	17	5.3
Yam and egg/fish sauce	16.1	5
Vegetable or Vegetable Juice	12.2	3.8
Pap & Moimoi (Beans pudding)	10	3.1
Yogurt	4.8	1.51
Reasons for not eating breakfast		
I do not have time in the mornings	153	38.5
I am not hungry	103	25.9
I am watching my weight	29	7.3
I do not like breakfast foods	14	3.5
My family does not eat breakfast	3	0.8
My friends do not eat breakfast	6	1.5
I do not have food to eat for breakfast	13	3.3
Eats snacks regularly	392	98.7
Frequency of snacks consumption per day		
Once	104	26.5
Twice	159	40.6
Thrice	78	19.8
More than thrice	51	13.1

3.4. Association Between Breakfast Consumption and Nutritional Status

There was no statistically significant association between breakfast-consumption habits and nutritional status; however, the mean BMI for those who skipped breakfast was significantly higher than that of those who ate breakfast (19. 33 ± 3. 27kg/m^2; 18.56 ± 3.05 kg/m^2; p=0.019; Table 3).

Table 3: Association between breakfast consumption and nutritional status

Breakfast consumption	Underweight	Normal	Overweight	Obese	Total	X^2	P
	Freq (%)	Freq (%)	Freq (%)	Freq (%)			
Ate breakfast	23 (10.1)	182 (80.2)	16 (7.1)	6 (2.6)	227	2.412	0.491
Skipped breakfast	10 (6.0)	140 (83.3)	12 (7.1)	6 (3.6)	168		
TOTAL	33 (8.4)	322 (81.5)	28 (7.09)	12 (3.0)	395 (100)		
Breakfast consumption			**BMI means**	**SD**			**P**
Ate breakfast			18.56	3.05			
Skipped breakfast			19.33	3.27			0.019

4. Discussion

4.1. Discussion

Only a few of the respondents (17.6%) had good knowledge about breakfast consumption. Although breakfast knowledge was poor, more than half of the respondents (56.17%) ate a daily breakfast, which was consistent with other studies from Nigeria, Malaysia, and Europe; more than half of the respondents consumed a breakfast at least five times per week.[10,19] Adolescents in south of the Netherlands (83.5%)[7] and Britain (70%)[11]; however, had higher breakfast consumption rates. These differences may be due to different geographical areas and habits formed in these areas. Breakfast consumption versus breakfast skipping has been shown to improve glucose and insulin responses throughout the day.[20]

The majority of the respondents (80.9%) ate breakfast the day before the data collection. This higher percentage, compared to the regular breakfast consumption, could be attributed to the peculiarity of the data-period collection, which was during school examinations. Most students tended to eat breakfast to prevent hunger pangs while writing the examination. The results are comparative to another study among adolescents in South Africa where the majority (81%) of the participants ate breakfast the day before the data collection; however, another study in Australia and England showed that only 12% of the participants skipped breakfast on the morning of the study.[21,22]

In this study, the majority of the respondents ate breakfast at home (84.7%), and about 13.4% of the respondents ate their breakfast at school, which was comparative to the study conducted in Malaysia in which the majority of the participants ate their breakfast at home (72%), and only a quarter of the participants ate their breakfast at school (21.6%).[23]

The majority of the adolescents were within the normal range for BMI, which was consistent with the studies conducted in Malaysia and Brazil where the majority (71.2% and 72.3%, respectively) were within the normal range for BMI.[2,24] In this study, the prevalence of overweight and obesity were 7.1% and 3.0% respectively. In this study, the prevalence of overweight adolescents and obesity was 7.1% and 3.0%, respectively, which was lower than the results obtained in the Brazilian study where the prevalence of overweight adolescents and obesity was 18.3% and 9.3% respectively, and this was found among the adolescents who skipped breakfast. The prevalence of obesity varied in adolescents who skipped breakfast, which was as low as 7% and as high as 15% (documented in other reports).[6,25,26,27,28]

In this present study, boys in the age range of 10-12 and 13-15 were less likely to be overweight/obese than the girls in the same age groups. However, boys in the 16-19-age group were more likely to be overweight/obese (10.7) than girls of the same age (9.9). These findings did not correlate with the finds of an Italian study that showed that boys were more likely to be overweight or obese in a cohort of students in the age range of 11-15 years compared to the girls at all ages.[24,28]

There was no association between breakfast skipping and being overweight/obese; however, this study demonstrated a significantly higher mean of BMI among those who skipped breakfast compared to

those who ate breakfast. This finding was consistent with other studies among Greek, Malaysian, and New Delhi adolescents, which showed that the BMI was significantly higher among those who skipped breakfast compared to their counterparts who did not. A systematic review similarly observed that 6 out of 33 analyzed studies did not find any association between the anthropometric measurements and breakfast skipping, while the remaining 27 studies showed that there was a positive relationship between breakfast skipping and being overweight/obese.[6,23,25,29]

The frequently consumed foods were milk, rice, processed and packaged cereals, tea or coffee, fresh fruit, fruit juice, egg, and bread, which was in line with other studies that showed that ready-to-eat cereals (RTECs), milk, bread, eggs, and fruit/juice were commonly consumed foods at breakfast.[22]

The majority of the adolescents who ate a daily breakfast had mothers with only a primary level of education. This difference could be due to the availability of the mothers with a primary level of education, while mothers with a tertiary level of education were mostly career women who did not have sufficient time to make breakfast for their families. The results were in contrast with the study conducted in Jordan wherein breakfast consumption significantly increased among students whose mothers were better educated.[2]

The two leading reasons for skipping breakfast were lack of time and lack of appetite, which were in agreement with other studies conducted in Sherbrooke, Benin, and Australia.[6,15,22] However, in Ghana, the leading reason for skipping breakfast was lack of food at home. This finding can be prevalent in developing countries, especially when the adolescents belong to the low socioeconomic status.[30] A study on the rural schools in Minnesota similarly observed that many of the adolescents would rather sleep than wake up in the morning to make breakfast before going to school.

Another reason for skipping breakfast that was reported in this study was to achieve weight loss, especially among the girls. However, it must be noted that skipping breakfast encourages consumption of more food later in the day, which may actually result in increased weight gain and ultimately lead to overweight and obesity. Loss of appetite or not feeling hungry in the mornings were common factors in this present study, which were also documented in Minnesota and other previous studies.[10-15] Other perceived barriers to consumption of breakfast in the latter study were cost of food/affordability, quality of food available, and stigma.[11] However, these factors were not identified in this present study.

4.2. Strengths and Limitations of the Study

This study was performed among boys and girls in both urban and rural communities in Lagos, Southwest Nigeria, thereby giving us the opportunity to assess breakfast consumption and its relationship with the nutritional status of a wide range of secondary-school adolescents.

The minimum sample size calculated was used for the study. The study was conducted in one LGA in Lagos this might have limited our sample variation.

The breakfast-survey questionnaire was originally used among the English participants with major differences in the diet compared with participants in Lagos; therefore, the results obtained from the Nigerian participants might have been different if a locally developed instrument was used.

5. Conclusion and Global Health Implications

Breakfast knowledge was low, while its consumption was average. Most of the adolescents had normal nutritional status, but those who skipped breakfast had a ($19.33 \pm 3.27 kg/m^{2)}$ than those who ate breakfast (18.56 ± 3.05 kg/m^2) ($p=0.019$). Nutrition education (with an emphasis on the importance of breakfast consumption), with the intention of behavioral change, should be intensified, especially among adolescents. These findings are useful for policymakers to design policies that encourage breakfast consumption among secondary-school students. Knowledge relating to the importance of breakfast eating should be included in the curriculum of health education, and learning this knowledge should be compulsory for all secondary-school students.

Compliance with Ethical Standards

Conflicts of Interests: *The authors declare that they have no competing interests.* ***Financial Disclosure:*** *There are no financial conflicts of interest to disclose.* ***Funding/Support:*** *The authors did not receive any funding for this study.* ***Ethical considerations****. Ethical approval was obtained from the Health Research and Ethical Committee of Lagos University Teaching Hospital (HREC approval number is ADM/DCST/HREC/APP/304). Permission was obtained from the principals of the schools. Informed consent was obtained from each respondent before administering the questionnaire and utmost confidentiality of information obtained was ensured.* ***Acknowledgments:*** *The authors hereby acknowledge the Principals of all the secondary schools used for giving permission and support for data collection.* ***Disclaimer:*** *Facts and opinions in articles published are solely the personal statements of respective authors. Authors are responsible for all contents in their article(s) including accuracy of the facts, statements, citing resources, and so on.*

Key Messages

- Knowledge of the importance of breakfast is low among adolescents in Lagos, Nigeria.
- Older adolescents skip breakfast more than younger adolescents.
- Only 10.1% of the adolescents were overweight/obese, and most of them had normal nutritional status.
- The study did not demonstrate any association between breakfast consumption and the prevalence of overweight.

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