Food intake and meal pattern of adolescents in school in Ila Orangun, south-west Nigeria

Ogunkunle MO, BSc, MSc, Assistant Lecturer
Department of Human Nutrition, University of Ibadan, Nigeria
Oludele AS, BSc, Lecturer
Department of Home Economics, Osun State College of Education, Ila Orangun, Nigeria
Correspondence to: Ogunkunle Morenike, e-mail: morekey56@yahoo.com
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Abstract

Objective: This study was designed to assess the food intake and describe the meal pattern of adolescents attending public secondary schools in Ila Orangun, south-west Nigeria.

Design: This was a cross-sectional descriptive study that used a pretested, interviewer-administered, semi-structured questionnaire to collect information on sociodemographic data. A food frequency questionnaire and 24-hour dietary recall was used to collect information on food intake and meal patterns.

Setting: The setting was Ila Orangun town, located in Osun State in south-west Nigeria.

Subjects: The sample (n = 302) comprised adolescents between the ages of 10 and 19 years, attending public schools.

Outcome measures: Socio-demographic characteristics, meal patterns, food intake and frequency of consumption were assessed. Descriptive statistics were used for analysis, and chi-square to test for any association between the variables.

Results: The daily energy intake was higher than that recommended in 66% of the adolescents, carbohydrate intake higher in 62%, and fat and protein intake lower in 51% and 42%, of the adolescents, respectively. Low iron intake was significantly higher in females than in males (p-value < 0.05). One third (38%) skipped breakfast, and while the majority consumed supper, most participants ate snacks instead of lunch. A large proportion consumed fruit and vegetables, as well as milk and milk products, infrequently. The proportion of females who missed breakfast was significantly higher than that of the males (p-value < 0.05).

Conclusion: A high daily energy intake was reported in the adolescents. There was inadequate consumption of calcium and iron. A flawed meal pattern was observed, characterised by skipping breakfast and replacing lunch with snacks. Consuming breakfast, improving fruit and vegetable intake, and eating animal sources of protein should be encouraged in adolescents, and especially in females. This could assist in preventing the development of diseases associated with an inadequate intake of nutritious food.

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Introduction

Adolescents are defined by the World Health Organization (WHO) as persons aged 10-19 years. They comprise 20% of the global population. Approximately 80% live in developing countries.[1] Adolescents are a nutritionally vulnerable age group because of their increased nutritional needs, eating patterns, lifestyles and susceptibility to environmental influences. Therefore, healthy eating habits play a fundamental role in growth and development during adolescence.[2]

However, poor eating habits are often observed in adolescents, whose diets are characterised by a low intake of dairy products, fruit, green vegetables, protein and iron, and a high intake of sugar, soft drinks, and sodium- and energy-dense food items, both in developed and developing countries.[2-7] This eating pattern is of major concern because it can lead to overweight and a higher probability of chronic noncommunicable diseases (NCDs), such as obesity, diabetes, high blood pressure, dyslipidaemia, cardiovascular diseases and cancer later in life.[8-11]

An annual report by Sight and Life[12] identified Nigeria as one of several countries with severe micronutrient malnutrition. Kurz and Johnson-Welch[13] also reported that one of the nutritional problems affecting adolescent populations worldwide, and Nigeria in particular, is a micronutrient deficiency in iron, calcium and

vitamin A. Studies from industrialised countries have reported that adolescents have unique dietary patterns that predispose to NCDs in adult life.[14] Certain nutritional problems, such as deficiencies in certain micronutrients, like zinc, calcium, iron and vitamin A, are frequently observed in adolescents in developed and developing countries, including Nigeria.[8,12-15]

A certain pattern of eating has been observed to be important for healthy living. People who skip breakfast are more likely to have difficulty concentrating by mid morning and to experience a decrease in intellectual performance.[4,16] Also, it is likely that they will consume snacks that are high in fat, salt and sugar at other times of the day[17] to increase their total daily energy intake. This can predispose them to obesity. By contrast, it has been observed that individuals who develop healthy eating habits early on in life are more likely to maintain them into adulthood, and to have a reduced risk of developing chronic diseases.[18] Thus, it is necessary to promote and encourage a healthy eating pattern in adolescents.

Providing information on nutrition and the eating habits of adolescents is important in order to identify risky and unhealthy behaviour in this age group. This should help when executing effective intervention programmes to bring about positive changes in food intake and to reduce the occurrence and development of chronic NCDs later in life. Hence, this study was conducted to evaluate the food intake and meal patterns of adolescents in school in a community in south-west Nigeria.

Method

Study area

This cross-sectional study was carried out in Ila Orangun, south-west Nigeria, an ancient, semi-urban community located within latitude 8° 00' 09" N and longitude 4° 57' 09" E. The community has one local government area and 11 wards. The population was 62 049 at the 2006 census. The community has six public secondary schools and a tertiary institution that awards a National Certificate of Education.

Sample population

There are six public secondary schools in Ila Orangun. Letters were written and sent to the schools to inform them about the objectives of the study, and to seek permission to include their students as participants therein. One hundred per cent positive responses were received. An average of 50 adolescents between the ages of 10 and 19 years was randomly selected from each of the six schools. Five classrooms were chosen from each school using a systematic random sampling method. Ten adolescents were randomly selected from each class using the school register. A total of 302 adolescents gave their oral consent and formed the population size of the study.

Data collection

A pretested, interviewer-administered questionnaire was used to collect data on the demographic and socioeconomic status of the respondents. Food intake and meal patterns were assessed using a pretested food frequency questionnaire (FFQ) and 24-hour dietary recall. The respondents were asked to report the number of times that they consumed food from each of the food groups listed in the FFQ. Frequency of intake pertaining to seven food groups was assessed and included fruits; vegetables; bread and cereals; legumes; milk and milk products; meat, fish and poultry; and soft drinks, sweets and snacks. Response options were the following: daily, 4-6 times per week, less than three times per week, and never. Foods that were consumed daily or 4-6 times a week were categorised as "frequently consumed". Those eaten occasionally or less than three times a week were classified as "infrequently consumed".

The intake of the three main meals (breakfast, lunch and supper) and three in-between meals (a morning, afternoon and evening snack) were evaluated using pretested 24-hour recall. A pilot study was conducted in the community to gain an idea of when its members usually consumed breakfast, lunch and supper. Foods eaten between 06h00 and 10h30 were regarded as breakfast; those between 10h31 and 12h00 as morning snacks; those between 12h01 and 16h30 as lunch; those between 16h31 and 19h00 as afternoon snacks; and those between 19h01 and 22h00 as supper. Whatever was eaten between 22h01 and 06h00 was regarded as an evening snack. To obtain information about the portion sizes of food intake when completing the 24-hour dietary recall, common kitchen household measurements were used, e.g. soup spoons, teaspoons and food models of various sizes. These were later converted to their gram equivalent. The values of total energy (measured in kilojoules) consumed per day, macronutrients (carbohydrates, protein and lipids) and micronutrients (calcium and iron) were calculated using the *Nutrient composition of commonly eaten foods in Nigeria: raw, processed and prepared,* compiled by Oguntona and Akinyele.[19] The total intake of assessed macronutrients and micronutrients were compared with the recommendations of the WHO/Food Agriculture Organization of the United Nations (FAO).[18] The intakes was then classified as being below the minimum recommendation, within the recommendation, or above the maximum recommendation.

Data analysis

Data were analysed using SPSS® version 13. Descriptive statistics (mean ± standard deviation and percentages) were generated to analyse the sociodemographic factors. Chi-square was used to explore the possible association between the variables of food intake and gender, and meal pattern and gender. A p-value of less than 0.05 was considered to constitute a statistically significant difference.

Results

The sociodemographic characteristics of the subjects (Table I) showed that there were 50.7% females and 49.3% males. The mean age of the respondents was 14.3 ± 2.5 years, and the majority of the adolescents (61.3%) were between 10 and 14 years of age. 38.7% were between 15 and 19 years of age. Only 15.9% of the respondents' household head had achieved tertiary education, while 31.1% and 28.8% had gained secondary and primary school education, respectively. 24.2% had no formal education. Many of

Table I: Sociodemographic characteristics of the adolescents

	n	%
Sex		
Male	149	49.3
Female	153	50.7
Age (years)		
12-14	185	61.3
15-19	117	38.7
Educational status of household head		
No formal education	73	24.2
Primary school education	87	28.8
Secondary school education	94	31.1
Tertiary school education	48	15.9
Occupation of father		
Civil servant	32	10.6
Business man	85	24.2
Artisan	102	33.8
Petty trader	67	22.2
Unemployed	16	5.3
Occupation of mother		
Civil servant	26	8.6
Business woman	98	32.5
Artisan	85	28.2
Petty trader	43	14.2
Housewife or unemployed	50	16.7
Mode of living		
Living with parents	247	81.8
Living with guardian	44	14.6
Living alone	11	3.6
Living in the boarding house	-	-

the respondents' parents were employed, and 17% were either housewives or unemployed. The majority (81.8%) of the respondents lived with their parents. Very few (3.6%) lived alone. None of them lived in the boarding house.

Table II shows that the majority of the participants (76.5%) frequently consumed food from the bread and cereals group. Soft drinks, sweets and snacks were frequently consumed by 87.2% of the adolescents. A total of 52.2% of the adolescents consumed foods from the legume group frequently, while almost half (48.8%) respondents ate food from the meat, fish and poultry group frequently. A large proportion consumed fruit (69.8%) and vegetables (70.8%) infrequently. Only 23.5% ate bread and cereals infrequently, while nearly two thirds (61.3%) consumed food from the milk and milk products group infrequently. Legumes and meat, fish and poultry were eaten infrequently by 47.8% and 51.2% of adolescents, respectively.

The frequency of food consumption by gender (Table III) showed that significantly more males consumed fruit more frequently than their female counterparts (p-value = 0.016). The proportion of males who consumed milk and milk products, as well as meat, fish and poultry, frequently, was significantly higher than it was in their female counterparts (p-value < 0.05).

The energy and nutrient intake of the adolescents is represented in Table IV. The total energy intake per day was higher than that recommended in 66.2% of the adolescents. The consumption of carbohydrates was above the recommended limit in 61.9% of the subjects, while the consumption of lipids was above the upper-recommended limit in 50.6% of the adolescents. The intake of protein was also above the recommended limit in 24.2% of the subjects. The intake of calcium and iron was above the recommended limit in 7% and 52% of the adolescents, respectively.

However, the consumption of carbohydrates, protein and fats was below the lower-recommended limit in 14.2%, 42% and 3% of the adolescents, respectively. The difference in the proportion of males and females who consumed the recommended intake of carbohydrates, lipids and proteins was not significant (p-value

Table II: Frequency of consumption from each food group by the adolescents

	Food groups (n = 302)	Frequent consumption			Infrequent consumption			
		D % (n)	4-6 x/wk % (n)	Total % (n)	< 3 x/wk % (n)	O % (n)	N %	Total n (%)
1	Fruit	29.1 (88)	1.1 (3)	30.2 (91)	49.3 (149)	20.5 (62)	0.0	69.8 (211)
2	Vegetables	26.4 (79)	2.8 (9)	29.2 (88)	27.5 (83)	43.3 (131)	0.0	70.8 (214)
3	Bread and cereals	58.9 (178)	17.6 (53)	76.5 (231)	21.8 (66)	1.7 (5)	0.0	23.5 (71)
4	Milk and milk products	16.8 (51)	21.9 (66)	38.7 (117)	57.4 (173)	3.9 (12)	0.0	61.3 (185)
5	Legumes	13.8 (42)	38.4 (116)	52.2 (158)	29.8 (90)	18.0 (54)	0.0	47.8 (144)
6	Meat, fish and poultry	26 (76)	22.8 (69)	48.8 (145)	48.7 (147)	1.5 (10)	0.0	51.2 (157)
7	Soft drinks, sweets and snacks	51.5 (164)	32.7 (99)	87.2 (263)	13.6 (41)	2.2 (7)	0.0	15.8 (48)

D: daily, n: total number of respondents, O: occasionally, N: never
< 3 x/wk: less than three times per week, 4-6 x/wk: 4-6 times per week

Table III: Frequency of food consumption according to gender

Food groups (n = 302)	Males		Females		p-value
	Frequent consumption n (%)	Infrequent consumption n (%)	Frequent consumption n (%)	Infrequent consumption n (%)	
Fruit	64 (21.2)	85 (28.1)	27 (8.9)	126 (41.7)	0.016*
Vegetables	45 (14.9)	104 (34.4)	43 (14.2)	110 (36.4)	0.058
Bread and cereals	133 (44)	16 (5.3)	98 (32.5)	55 (18.2)	0.201
Milk and milk products	89 (29.5)	60 (19.9)	28 (9.3)	125 (41.4)	0.001*
Legumes	79 (26.2)	70 (23.2)	79 (26.2)	74 (24.5)	0.352
Meat, fish and poultry	122 (40.4)	27 (8.9)	23 (7.6)	130 (43.5)	0.002*
Soft drinks, sweets and snacks	130 (43.5)	19 (6.3)	132 (43.7)	21 (7)	0.231

Table IV: The energy and nutrient intake of the adolescents by gender

Descriptor	Male n (%)	Female n (%)	Total n (%)	p-value
Energy (kJ)				
Below recommended	49 (16.2)	53 (17.6)	102 (33.8)	0.282
Above recommended	100 (33.1)	100 (33.1)	200 (66.2)	
Carbohydrates				
Below 55%	20 (6.6)	23 (7.6)	43 (14.2)	
Above 75%	105 (34.8)	82 (27.1)	187 (61.9)	
55-75%	40 (13.2)	32 (10.6)	72 (23.8)	
Lipids				
Below 15%	1 (0.3)	8 (2.7)	9 (3)	0.379
Above 30%	77 (25.4)	76 (25.2)	153 (50.6)	
15-30%	71 (23.5)	69 (22.9)	140 (46.4)	
Proteins				
Below 10%	60 (19.9)	67 (22.2)	127 (42)	
Above 15%	40 (13.3)	33 (10.9)	73 (24.2)	
10-15%	49 (16.2)	53 (17.5)	102 (33.7)	
Calcium				
Below recommended	104 (34.4)	177 (58.6)	281 (93)	
Above recommended	15 (4.9)	6 (2.1)	21 (7)	
Iron				
Below recommended	18 (6)	127 (42)	145 (48)	
Above recommended	131 (43.3)	26 (6.6)	157 (52)	
Total	149 (49.3)	153 (50.7)	302 (100)	

> 0.05). 93% of the adolescents' intake of calcium was below the recommended limit, while 52% reported an intake of iron that was below the recommended limit. The difference in the proportion of females and males who had an inadequate intake of iron was statistically significant (p-value < 0.05).

Table V: Meal pattern of the adolescents by gender

Meal eaten	Yes/No	Male (n = 149) n (%)	Female (n = 153) n (%)	Total (n = 302) n (%)	p-value
Breakfast	Yes	120 (39.7)	68 (22.5)	188 (62.2)	0.002*
	No	49 (16.2)	65 (21.5)	114 (37.4)	
Morning snack	Yes	66 (21.9)	64 (21.2)	130 (43.1)	0.771
	No	83 (27.5)	89 (29.5)	172 (57)	
Lunch	Yes	10 (3.3)	11 (3.6)	21 (6.9)	0.111
	No	139 (46)	142 (47)	281 (93)	
Afternoon snack	Yes	118 (39.1)	143 (47.4)	261 (86.5)	0.030*
	No	39 (12.9)	20 (6.6)	59 (19.5)	
Supper	Yes	140 (46.4)	147 (48.7)	287 (95.1)	0.225
	No	9 (3)	6 (2)	15 (5)	
Evening sack	Yes	29 (9.6)	23 (7.6)	52 (17.2)	0.339
	No	120 (39.7)	130 (43.1)	250 (82.8)	

*: p-value < 0.05

The meal patterns of the participants are presented in Table V. It was observed that two third of the adolescents had breakfast (62.2%). Very few (6.9%) consumed lunch, while the majority had supper (95.1%). 43.1% had a morning, 86.5% an afternoon, and 17.2% an evening, snack. The proportion of females (21.5%) who skipped breakfast was significantly higher than the proportion of males (16.2%) who did so (p-value 0.002). Also, the difference in the proportion of males and females who did not consume an afternoon snack was statistically significant (p-value 0.030).

Discussion

Overconsumption of energy has been implicated in the incidence of diseases, such as obesity. Obesity is a risk factor for the development of certain chronic diseases, such as diabetes, cardiovascular disease and dyslipidaemia.[18,20]

Three quarters of the adolescents' total energy intake of macronutrients per day was found to be above the recommended value. The majority consumed a high intake of carbohydrates and lipids. The same proportion of males and females had a total energy intake per day above the recommended value. Anyika et al[21] reported on a daily intake of energy above the recommended values in the majority of adolescent girls in Nigerian secondary schools and universities. Garcia et al[5] and Kazapi et al[3] also found that the majority of the studied adolescent population had a total intake of energy above the recommended limit for their age and activity level. This may have had a positive effect on their weight, and may have contributed to a higher risk of overweight and obesity in adolescence.[7] Obesity lays the foundation for many chronic diseases later in life, especially in adolescents who are physically inactive.[20] A large proportion of the adolescents in this study consumed food from the bread and cereals, and sweets and confectionery, groups, often and very frequently, respectively. This might have contributed to the high daily energy intake that was observed in the adolescents. This report supports the findings of Anyika et al[21] who observed that a frequent intake of sweets and confectionery made a large contribution to the total daily energy intake of adolescents.

There are three determinants of iron uptake in humans, namely the iron content of the diet, the bioavailability of the iron therein, and the presence of promoters or inhibitors of iron absorption therein.[22] The dietary source of iron strongly influences absorption efficiency. The amount of iron absorption varies from less than 1% to more than 20%, depending on the food.[23] Foods of vegetable origin are at the lower end of the range, dairy products are in the middle, and meat is at the upper end because heme iron in meat is better absorbed.[23] In this study, half of the adolescents consumed fish and meat (animal protein) infrequently. Fish and meat are excellent sources of heme iron that are easily absorbed in the body. Males were found to significantly consume meat and fish, as well as milk and milk products, more so than the females (p-value < 0.05). This is consistent with the report of Henry-Unaeze and Okonkwo[24] who reported that a large proportion of the adolescent population consumed meat infrequently, and also had a low dairy intake.

Furthermore, the protein sources of half of the adolescents were observed to be from plant sources (legume groups). This is consistent with the findings of Anyika et al[21]and Henry-Unaeze and Okonkwo,[24] who, when studying the adolescent population in Nigeria, found that the protein sources of the majority of the adolescents were derived from legumes, especially cowpeas. Protein from plant sources contains non-heme iron. Appreciable quantities of phytates and oxalates therein interfere with the absorption of the non-heme iron by binding the iron and rendering it unavailable for absorption.[22] This could partly explain why more than a third of the adolescents did not meet the protein intake recommendation, despite the fact that many of them frequently consumed food from the legume group. This observed food intake pattern was coupled with a low and infrequent intake of fruit and vegetables, an excellent source of iron-absorption enhancers, e.g. vitamin C. This may explain the reason for the deficit of iron in the adolescents. The deficit in iron intake was significantly higher in the females, than in the males (p-value < 0.05). This is of great concern because females have a greater need for this mineral as they need to compensate for postmenarche losses and thereby prevent anaemia.

The majority of the adolescents did not meet the recommended allowance for calcium. This was also observed by Henry-Unaeze and Okonkwo,[24] who reported on the low calcium status of adolescent girls. Two thirds of the adolescents consumed milk and milk products (a significant source of calcium) infrequently. The majority also consumed a low and infrequent intake of vegetables which could have been an alternative source of calcium in their diet. This may be the reason for the low observed calcium intake in the majority of the adolescents. Gao[25] opinioned that it is difficult for persons to meet their calcium intake if they do not drink milk. Whitney and Rolfes[26] stated that it is possible for individuals who do not consume milk to obtain adequate calcium, provided that they consume vegetables as they are rich in calcium. The American National Kidney Foundation[27] documented that generally, the bioavailability of calcium from vegetables is high. In this study, males were found to significantly consume milk more frequently than their female counterparts (p-value < 0.05). Similar observations were reported by other researchers who studied food intake and consumption patterns of the adolescent population.[2-4,6,28]

As milk is an excellent source of calcium, this finding is of great concern, particularly with regard to female adolescents. Calcium consumption is important in preventing the development of osteoporosis, which is more common in women in adulthood.

Two thirds of the adolescents consumed breakfast, the majority consumed supper, and very few ate lunch. However, one third of the subjects skipped breakfast, a habit that is often observed by researchers and which was also evident in this study,[4,6,16,29,30] in which missing breakfast was observed to be significantly higher in females, than in males. This supports the report of Prochnik-Estima[6] whereby one quarter of the adolescents skipped breakfast.[6] Nicklas et al[16] noted that many adolescents missed breakfast and that this was more prevalent in females, than in males. The reports of Keski-Rahkonen et al[4] and Kosti et al[31] show that missing meals promotes the replacement of meals with snacks which are energy dense and nutritionally inadequate, especially with regard to micronutrients. A large proportion of the adolescents in this study substituted their lunch with snacks which might have contributed to the dietary inadequacy and nutritional imbalance that was observed in the adolescents.

Conclusion

The study shows that a large proportion of the adolescents adhered to an inadequate meal pattern characterised by no breakfast and the replacement of lunch with snacks. In general, food intake was poor and typified by the overconsumption of energy and inadequate consumption of protein, calcium and iron. Inadequate consumption of micronutrients was more prevalent in females than in males. The results clearly show that there is a need for nutrition education

programmes which target adolescents, and particularly females, in this study area. The focus of education should be on encouraging breakfast consumption, improving the intake of fruit and vegetables, and consuming animal sources of protein, as well as making healthy food choices. It is possible that such programmes might help to establish healthy eating habits early in life, and thus reduce the incidence of NCDs in adulthood.

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