



Eating habits and nutrition status of Nigerian school children in rural and urban areas (NigeriaLINX pilot project)

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ABSTRACT

Background: Healthy eating habits during childhood have been identified as a foundational support for the growth, development, and intellectual well-being of schoolchildren and as a protection against diseases that affect learning and functional capacity. This study examined the eating habits of the previous day, weekly, and daily between Nigerian children in rural and urban elementary schools.

Methods: Data were collected between March and May 2021 with an instrument extracted from the Health and Attainment of Pupils in a Primary Education Network Survey (HAPPEN survey). Participants for the study were school children (aged 7–13 years). The multistage sampling technique was used to draw samples from the target population. Two schools were randomly selected for the study (one in the urban area of Lagos and the other in the rural area of Ekiti state). A total of 214 healthy children (urban school = 118; rural school = 96). The survey was conducted online and on-site during the school hours. The data were analysed using frequency count, percent, mean, standard deviation, and independent *t*-test at $p < 0.05$ level of significant.

Results: The result of the *t*-test showed that there are significant differences in the weekly consumption of soft drinks ($p = 0.02$), fizzy drinks ($p = 0.00$), sugary snacks ($p = 0.00$) and the consumption of fish ($p = 0.00$) by the rural and urban schoolchildren.

Conclusions and recommendations: Based on the results, it was concluded that most of the children were relatively well fed with moderately healthy dietary choices. Urban children are making healthy dietary choices and few unhealthy choices. However, rural schoolchildren are making healthy dietary choices relative to affordable options. The government to urgently bridge the nutritional gap between urban and rural schoolchildren through food market intervention and school nutrition campaign.

1. Background

Childhood is the most important phase of life as the eating patterns are established at this early stage of life [1]. Healthy and good proper diet is a major factor in the promotion and maintenance of good health throughout life [2]. The dietary habits of children significantly contribute to their cognitive development and school performance. Children who are in school require a sufficient amount

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of protein to meet their maintenance demands and promote healthy growth. Adequate nutrition guarantees better health status and ensures a long attention span for improved learning performances. Access to a good breakfast and mid-day meal is a very crucial component of nutritional status, as well as general well-being and cognitive development of schoolchildren. Children who are healthier and better fed are in school longer, learn more, and grow up to be healthier and more effective people [3]. According to the Recommended Dietary Allowances (RDAs), protein requirements per kg of body weight drop from around 1.8 g in young children to 1.2 g in late childhood. Combining plant and animal foods, such as cereal with beans, nuts, lentils, seeds, milk, and other dairy products, can offer the correct amount of protein to meet these demands [4].

School-aged children require adequate food both in quantity and quality to remain healthy. Only by a balanced diet can one provide his body with the energy it needs, maintain its immunity, control their body's functions, and repair and maintain their tissues. Snacks consumed in-between meals also add to total food intake necessary to meet the recommended daily energy and nutrient intakes of school children. The type and quantity of food and beverages consumed by children while they are in school has a significant potential impact on their health and wellbeing from the perspective of health promotion [5].

The daily calorie need for children is determined by taking into account their age, sex, and level of activity. Children who are going through a growth spurt need more calories to both sustain and build their bodies. For children aged 11 to 12, a daily calorie intake of between 1800 and 2200 kcal is advised. Using the 60–65 kcal/kg/day rule for children aged 6 to 8 and the 35–45 kcal/kg/day rule for those aged 9 and above, we may further generalize caloric needs. Growth charts are essential for guiding children's nutritional counselling [6].

Any one of the nutrients the body requires can be deficient, which can have major health repercussions. Consequently, it is crucial to eat a diet full of both macronutrients and micronutrients. The daily calorie requirement for carbs, which are made up of monosaccharides like fructose, glucose, and galactose, should be between 50 and 55%. Carbohydrates have an energy density of 4 kcal per gramme. Complex carbohydrates with a low glycemic index are preferred to simple carbs like dextrose because they raise blood sugar levels gradually [7].

Simple sugars should not exceed five to ten percent of the daily calorie intake. Consuming legumes, whole grains, beans, fruits, and vegetables will help you meet your daily carbohydrate needs [8]. Amino acids are the building blocks of proteins. Energy is provided by these subunits, which are also necessary for the development of the body's structural components like muscle, bone, and ligaments. Proteins make up about 30% of the body's dry weight. Aim for 20% of your daily calories to come from protein-rich foods like red and white meat, eggs, and legumes. In a significant prospective study, plant-sourced proteins were demonstrated to reduce cancer and cardiovascular disease-related mortality when substituted for animal proteins [9].

Since the human body is capable of producing it, dietary cholesterol is not strictly necessary. But when used, it shouldn't exceed 300 mg per day. A high-fat diet is linked to an elevated likelihood of cardiovascular disease and the development of obesity [10]. The consumption of fats can be decreased by substituting white meat and fat sources high in monosaturated fats, such as olive oil, avocado, almonds, and flaxseed, for red meat, fried foods, and dairy products that include fat. By adding weight to the stool and promoting peristalsis, fibre helps the digestive system. It guards against colon cancer and avoids diarrhoea and constipation. The main sources of fibre are fruits and vegetables, and it is advised that each person eats at least five servings of these foods each day. The ideal daily fibre intake for children is age +5 g. A diet high in fibre can help lower cholesterol, boost statin tolerance, and lower the risk of atherosclerosis, all of which can help avoid cardiovascular illnesses [11].

The production of rhodopsin, a photoreceptor pigment in the retina, and the regeneration of epithelial cells depend on vitamin A, also known as retinol (RDA = 700 µg–900 µg retinol activity equivalents (RAE)/day). Xerophthalmia, keratomalacia, and night blindness can all result from vitamin A deficiency [12]. In a recent systematic analysis, urolithiasis incidence was found to be correlated with lower water intake. While drinking enough water does not reduce the prevalence of obesity or type II diabetes, it most definitely lowers daily calorie intake [13]. The best beverage to drink to meet your daily hydration needs is plain water [14].

According to Bourdieu's theory of the relationship between social positions and food preferences and consumption in general, people in different social positions have different food preferences based on their distance from necessity and the symbolic significance of particular foods. Bourdieu challenges the view frequently held by economists that, aside from their financial resources, consumers are largely comparable. When describing various consuming habits, he first used the term "cultural capital" and stressed the connection between gender and food preferences. Regarding the expenses of food and its filling capacities, economic capital was crucial. Groups with high levels of cultural capital were less interested in filling foods and more interested in the unusual and nutritious foods associated with urban regions. Compared to men, women were more concerned in eating well. When economic capital remained stable, the impact of cultural capital was independent [15].

However, Children who are eight years old and above in school have adequate cognitive awareness of nutrition with regard to preventing deficiency disorders, diet-related chronic degenerative diseases, and obesity, but their food choices do not reflect this knowledge or professional advice. Their eating habits are also influenced by personal preferences, advertising, and social forces. They want to eat snacks outside to satisfy their hunger and feel socially connected [16]. Nutritional difficulties in children can occur from dietary deficiencies, particularly from poor food choices that may be related to physiologic, social, and psychological variables [1,17]. In low-income developing countries such as India, a high prevalence of malnutrition has been observed among school-age children [18].

Leading contributors to morbidity and mortality among children include inappropriate eating patterns [4]. Obesity, diabetes, and other chronic health conditions and ailments can result from having too much fat deposited in the body as a result of unhealthy eating pattern [19]. Children obesity had increased significantly from 0.9% to 7.8% for girls and 0.7% to 5.6% for boys from 1975 until 2016 worldwide [20]. Studies across both developed and developing countries have identified certain unhealthy eating practises, including increasing the consumption of high-calorie snacks, skipping breakfast, eating out, consuming soft drinks, and consuming fewer fruits,

vegetables, and dietary supplements [21–23]. It was reported in a study that substantial health issues among schoolchildren in Nigeria, particularly in the rural areas, are caused by malnutrition (underweight, wasting, and stunting) [24]. Their dietary habits can be used to explain this. One of the most important public health issues of the twenty-first century is the rising prevalence of overweight and obesity among youngsters. Obesity is now a complex disease that is influenced by significant environmental, societal, genetic, personal, and medical factors. More over 5% of youngsters worldwide now have obesity, up from 2% in the previous 40 years [25]. Problems of nutrition has led to disease condition, death, absence of withdrawal from school, lack of concentration among others. Therefore, there is a need to investigate the eating pattern and nutrition status of children so as to recommend ways of preventing malnutrition, and intensify efforts in the area of implementation of health promotion programmes with particular attention paid to the urban areas and more importantly the rural population.

2. Methods

2.1. Study setting and study period

The study was conducted in two public schools in Nigeria. Each of the school is in the rural (Ekiti State) and urban areas (Lagos state) of Nigeria. The study was conducted between March and May 2021.

2.2. Study design and population

The descriptive cross-sectional design was adopted for the study. The participants were children (aged 7–13 years) who participated in the NigeriaLINX pilot project in Lagos and Ekiti State, Nigeria. The study's inclusion criteria specified that pupils ranging in age from 7 to 13 years and enrolled in either of the randomly selected schools were eligible to participate. Exclusion criteria included pupils whose parents withheld consent for participation, as well as those who were experiencing illness or incapacitation.

2.3. Sampling size and sampling procedures

The sample size was calculated using Epi Info version 7 on the following assumption: 95% confidence interval, 80% power, the expected frequency was 70% for the 2 clusters. The calculated sample size was 210. The multistage sampling techniques, which included simple random and systematic sampling techniques, were used to draw samples from the target population. Two schools were randomly selected for the study (one in urban area of Lagos and the other from the rural area of Ekiti state). A systematic random sampling technique was used to select the children from each school based on the attendance record of their classes. The sampling technique was used to select 232 pupils (rural = 96; urban = 118) from the 450 pupils (rural = 208; urban = 236) from both schools. Every second (2nd) child was sampled in each class (Primary/Basic 3–6). A random total of 214 healthy children finally participated in the study. Eight children were excluded from the study due to reported disability.

2.4. Data collection techniques and data quality assurance

The instrument used for the study was extracted from Health and Attainment of Pupils in a Primary Education Network Survey (HAPPEN survey). The survey was conducted online (for children in the urban area) and hard copies (for children in the rural areas) were distributed to children to complete during school hours. The research assistants helped guide the children and provided appropriate answers to the items of the instrument. The hard copies were filled back into the online survey form and monitored by the research lead to ensure data accuracy. Unique ID numbers were assigned to the data entered to protect the identity of the participants and ensure anonymity. Therefore, any traceable information to the participating children was removed from the datasheet.

2.5. Variables and outcome measurements

The sociodemographic variables for the study were age, gender, class, height (meter), weight (kilogram), body mass index and region. The age was recorded with reference to the day, month and year of birth. The study children were in the upper primary or basic 3 to 5. The height was measured to the nearest 0.1 cm using a fixed stadiometer. The weight was measured to the nearest 0.1 kg with a standard scale utilizing a portable balance. Body mass index (BMI) was calculated with IOFT and British centiles [26–28].

2.6. Data management and analysis

The LMS Growth add in for Microsoft Excel software was used to drive the z score and the standard deviation of BMI values. The British 1990 cut-off point was used to categorise BMI into: Thinness grade 3 (−3), Thinness grade 2 (−2), Thinness grade 1 (−1), Normal weight (0), Overweight (1), Obesity (2) [29]. The extracted HAPPEN Survey nutrition-related content was categorised into previous day (6 items), weekly (11 items) and daily (2 items) eating habits of the rural and urban children. All the analyses were performed using the SPSS (RRID:SCR_002865) and values of $p < 0.05$ were considered statistically significant. Frequency, percent, mean, standard deviation, and independent T-Test were used to analyse the collected data for the study.

2.7. Ethical consideration

The study was approved by the University of Lagos ethics committee (CMUL/HREC/02/21/829) and all participating children and their parents provided informed written assent and consent. Respondents were treated according to the Declaration of Helsinki.

3. Results

Table 1 comprises the physical characteristics and class distribution of the urban and rural children (age, gender, class, height, weight, BMI) between children from the rural and urban schools. The Table shows that the children of both schools are of the average age of 10 years old (rural = 10.43 and urban = 10.22). The gender distribution shows that there more male from the rural (male = 53.1% vs female = 46.9) and more female from the urban school (female = 50.8% vs male = 49.2%) in proportion to their total distribution. In class distribution, most of the respondents in the rural school were from the basic 6 (37.5) and for urban school was basic 5 (24.6). The children in urban school were taller (\bar{x} = 141.39) and heavier (\bar{X} = 37.75) than children from rural school. The BMI category distribution shows that most of the children fall into the normal weight category even though there are more normal weight children in urban school (65.25%).

As shown in **Table 2**, most of the children from the rural school (71.88%) ate cooked food (eba, amala, fufu, beans) the previous day as breakfast while most of the children from the urban school (29.66%) ate bread with tea, fried egg, butter or jam and (27.12%) of them also ate cooked food (eba, amala, fufu, beans) as breakfast. Most of children from the rural school drank water during breakfast the previous day (rural, 64.58%; urban school, 55.93%). However, more urban school (80.51%) drank a beverage during breakfast the previous day than rural children (9.38%). Almost all children who attended the urban school (80.51%) brought packed lunch to school, while 61.46% of the rural children brought packed lunch to school. More children from rural school (65.63%) drank water for lunch the previous day than children attending the urban school (63.56%).

The children attending the rural school (77.08%) consume more fruits the previous than children from the urban school (55.08%). They also consume more vegetables (91.67%) than the children attending the urban school (45.76%).

As shown in **Tables 3 and 5**, children from urban school (\bar{x} = 3.04) drank more soft drinks in a week compared with children from the rural school (\bar{x} = 2.25) with significant differences (p = 0.007, 95% CL [0.22,1.36]) and low effect size (Cohen's d = 0.38). The children from urban school (\bar{x} = 2.49) also drank more diet fizzy drinks in a week than children from the rural school (\bar{x} = 1.11) with significant differences (p = 0.00, 95% CL [0.86,1.89]) and moderate effects size (Cohen's d = 0.72). The same pattern of weekly consumption (urban = 4.71; rural = 3.36) for sugary snacks with significant differences (p = 0.00, 95% CL [0.7,2]) and moderate effect size (Cohen's d = 0.56).

As shown in **Table 4**, most of the school children had never gone to school hungry because there was no enough food at home (urban = 81.6%, rural = 64.9%). Similarly, the children had never gone to bed hungry because there was no enough food at home (urban = 91.2%, rural = 74.34%).

4. Discussion

Table 1 comprises the physical characteristics and class distribution of the urban and rural children (age, gender, class, height,

Table 1
Physical characteristics and distribution of the class of urban and rural children (n = 144).

Variables	Rural	Urban
Age \bar{x} (SD)	10.43 (1.18)	10.22 (1.12)
Gender n(%)		
Male	51 (53.1)	58 (49.2)
female	45 (46.9)	60 (50.8)
Class n (%)		
Primary/Basic 3	10 (10.4)	27 (22.9)
Primary/Basic 4	28 (29.2)	23 (19.5)
Primary/Basic 5	22 (22.9)	39 (33.1)
Primary/Basic 6	36 (37.5)	29 (24.6)
Height \bar{x} (SD)	133.79 (21.62)	141.39 (9.26)
Weight \bar{x} (SD)	28.09 (6.28)	37.75 (10.52)
BMI \bar{x} (SD)	15.35 (1.99)	18.62 (3.73)
BMI Category		
Thinness Grade 3	8 (8.42)	–
Thinness Grade 2	5 (5.26)	2 (1.69)
Thinness Grade 1	23 (24.21)	7 (5.93)
Normal Weight	57 (60)	77 (65.25)
Overweight	1 (1.05)	23 (19.49)
Obesity	1 (1.05)	9 (7.63)

Values are presented as mean (\bar{x}) and standard deviation (SD); percent (%), n (total number of samples).

Table 2
Previous day eating habits of the rural and urban children (n = 214).

S/N	ITEMS	REGION	
1.	What did you eat for breakfast yesterday?	Rural (n=96)	Urban (n=118)
		n(%)	n(%)
	Bread	0 (0)	35 (29.66)
	Cooked food e.g. eba, amala, fufu, beans	69 (71.88)	32 (27.12)
	Fruits e.g. oranges, grapefruits, banana	8 (8.33)	2 (1.69)
	Healthy cereals e.g. oat meals, cornflakes, golden morn, pap	7 (7.29)	17 (14.41)
	Nothing	0 (0)	8 (6.78)
	Pap	0 (0)	4 (3.39)
	Rice	0 (0)	10 (8.47)
	Snacks, e.g. puff, doughnut, chin-chin	8 (8.33)	3 (2.54)
	Spaghetti	0 (0)	3 (2.54)
	Sugary cereals e.g. coco pops, weetabix	3 (3.13)	2 (1.69)
	Yam	0 (0)	1 (0.85)
Yoghurt	1 (1.04)	1 (0.85)	
2.	What did you drink for breakfast YESTERDAY?	Rural (n=96)	Urban (n=118)
	Beverages	9 (9.38)	33 (27.97)
	Fruit Juice	16 (16.67)	2 (1.69)
	Nothing	2 (2.08)	4 (3.39)
	Pap	0 (0)	4 (3.39)
	Soft drink (High Sugar)	1 (1.04)	7 (5.93)
	Soft drink (Low sugar)	3 (3.13)	2 (1.69)
	Traditional Drink	3 (3.13)	0 (0)
	Water	62 (64.58)	66 (55.93)
	3.	What did you eat for lunch yesterday?	Rural (n=96)
Bought from the shops/vendors/bukka		23 (23.96)	16 (13.56)
Did not eat lunch		4 (4.17)	1 (0.85)
Packed lunch brought from home		59 (61.46)	95 (80.51)
School lunch		10 (10.42)	6 (5.08)
4.	What did you drink for lunch YESTERDAY?	Rural (n=96)	Urban (n=118)
	Custard	2 (2.08)	0 (0)
	Energy drink e.g. Lucozade boost, fearless, monster, red bull	0 (0)	1 (0.85)
	Fruit juice	11 (11.46)	8 (6.78)
	Milk/Ice cream/Yoghurt	14 (14.58)	8 (6.78)
	Nothing	2 (2.08)	0 (0)
	Soft drink (High Sugar)	2 (2.08)	25 (21.19)
	Soft drink (Low sugar)	0 (0)	1 (0.85)
	Traditional Drink	2 (2.08)	0 (0)
	Water	63 (65.63)	75 (63.56)
5.	How many portions of fruit did you eat YESTERDAY?	Rural (n=96)	Urban (n=118)
	0	22 (22.92)	53 (44.92)
6.	How many portions of vegeTable did you eat YESTERDAY	Rural (n=96)	Urban (n=118)
	0	8 (8.33)	64 (54.24)
	1-8 portions	74 (77.08)	65 (55.08)
	0	88 (91.67)	54 (45.76)

Values are presented as n (total number of samples), percent (%).

weight, BMI) between children from the rural and urban schools. The Table shows that the children in both schools are almost the same age. The gender distribution shows that there more male from the rural and more female from the urban school in proportion to their total distribution. In class distribution, most of the respondents in the rural school were from the basic 6 and for urban school was basic 5. The children in urban school were taller and heavier than the children in rural school. The distribution of BMI categories shows that most of the children fall into the normal weight category, although there are more normal weight children from the urban school.

The finding of the current study is in line with the report by the National Council for Health Statistics (NCHS) [31]. They reported that respondents aged 4 to 8 had prevalence rates of 60% underweight, 74% stunting, and 6.4% overweight, respectively. In a study carried out in an urban area of the Lagos State Ojo local government area, boys among school age children aged 1 to 10 years were more stunted, overweight, and underweight than girls [4]. Children from low-income families are more likely to have inadequate nutrient intakes and stunted growth [32]. However, even in these groups, there are some subtle factors that have a significant impact on food intake during the formative years, such as the family environment, the mainstream press, peers, or important adults (like teachers or sports role models). Children's energy requirements are influenced by their basal metabolism, rate of growth, size, age, and activity. Although sufficient calories are necessary to support growth and prevent protein from being used as fuel, too much calories can lead to obesity. Of the total energy intake, a suggested proportion is 50–60% as carbohydrate, 25 to 35% as fat and 10 to 15% as protein. The current findings are consistent with those of Simeon and colleagues, who demonstrated that children in rural areas are more likely to experience undernutrition whereas those in urban areas are more likely to experience overweight. They discovered that compared to metropolitan areas, a higher percentage of youngsters lived in rural areas and were underweight [33]. In a similar vein, a study came to the conclusion that both rural and urban areas had a higher percentage of children who were normal weight, whereas

Table 3
Weekly eating habits of the rural and urban children (n = 214).

S/N	ITEMS	REGION	
1.	How many days of the week did you drink at least one soft drink?	Rural (n=96)	Urban (n=118)
	0	7 (8.26)	18 (17.28)
	1-3 days	56 (53.76)	73 (70.08)
2.	How many days of the week did you drink at least one DIET fizzy drink?	Rural (n=96)	Urban (n=118)
	0	16 (18.88)	52 (49.92)
	1-3 days	52 (49.92)	52 (49.92)
3.	How many days of the week did you eat least one sugary snack?	Rural (n=96)	Urban (n=118)
	0	6 (7.08)	10 (9.6)
	1-3 days	25 (24)	51 (48.96)
4.	How many days of the week did you eat take away foods	Rural (n=96)	Urban (n=118)
	0	63 (74.34)	56 (53.76)
	1-3 days	18 (17.28)	52 (49.92)
5.	How many days of the week did you eat food prepared away from home?	Rural (n=96)	Urban (n=118)
	0	15 (14.4)	10 (9.6)
	1-3 days	63 (62.4)	57 (54.72)
6.	How many days of the week did you eat fish?	Rural (n=96)	Urban (n=118)
	0	61 (71.98)	51 (48.96)
	1-3 days	19 (18.24)	42 (40.32)
7.	How many days of the week did you eat meat?	Rural (n=96)	Urban (n=118)
	0	16 (15.36)	25 (24)
	1-3 days	63 (60.48)	64 (61.44)
8.	How many days of the week did you eat processed meat?	Rural (n=96)	Urban (n=118)
	0	8 (9.44)	25 (24)
	1-3 days	25 (24)	64 (61.44)
9.	How many days of the week do you eat dairy	Rural (n=96)	Urban (n=118)
	0	63 (60.48)	29 (27.84)
	1-3 days	19 (22.42)	9 (8.64)
10.	How many meals do you usually eat per day over the last week?	Rural (n=96)	Urban (n=118)
	0	22 (21.12)	43 (41.28)
	1-2 meals	55 (52.8)	66 (63.36)
11.	How many days of the week do you eat breakfast?	Rural (n=96)	Urban (n=118)
	0	31 (36.58)	35 (33.6)
	1-3 days	27 (25.92)	50 (48)
		Rural (n=96)	Urban (n=118)
	0	38 (36.48)	33 (31.68)
	1-3 days	21 (24.78)	19 (18.24)
		Rural (n=96)	Urban (n=118)
	0	36 (34.56)	52 (49.92)
	1-2 meals	39 (37.44)	47 (45.12)
		Rural (n=96)	Urban (n=118)
	0	1 (1.18)	1 (0.96)
	1-2 meals	8 (7.68)	11 (10.56)
		Rural (n=96)	Urban (n=118)
	0	87 (83.52)	106 (101.76)
	1-3 days	0 (0)	3 (2.88)
		Rural (n=96)	Urban (n=118)
	0	17 (16.32)	12 (11.52)
	1-3 days	79 (75.84)	103 (98.88)

Values are presented as n (total number of samples), percent (%).

rural areas had a higher percentage of underweight children [34]. According to Smith and colleagues, numerous studies have shown that children in metropolitan areas have better nutritional status than children in rural areas due to the availability of health care, food, and work prospects [35]. In Pakistan, a study reported that the majority of children, both urban and rural, were healthy. However, 36.7% of students in rural schools were underweight and 30% of students in urban schools were at danger of becoming overweight [36].

As shown in Table 2, most of the children from the rural school ate cooked food (eba, amala, fufu, beans) the previous day as breakfast while most of the children from the urban school ate bread with tea, fried egg, butter or jam and of them also ate cooked food (eba, amala, fufu, beans) as breakfast. Most of children from the rural school drank water during breakfast the previous day. However, more children from the urban school drank beverage during breakfast the previous day than the rural children. Almost all the children attending the urban school brought packed lunch to school. More children in the rural school drank water for lunch the previous day than the children from the urban school. The children attending the rural school consume more fruits the previous than children from the urban school. They also consume more vegetables than children attending the urban schools. The finding corroborates with a study [37] that reported a growing prevalence of obesity among children who eat breakfast. They found a correlation between the increase in the percentage of breakfast and the heightened rates of obesity. These pupils often ate breakfast away from home out of anxiety to avoid lateness to class. The rise in childhood obesity is due to both the availability of processed and junk food and the decline in physical activity. Additionally, it was reported that respondents from metropolitan areas tended to skip breakfast more frequently. Due to the accessibility of fast food in urban areas, children in urban areas consumed more junk food than students in rural areas, including chocolate, soft drinks, and instant noodles and macaroni [36].

Table 4
Daily eating habits of the rural and urban children (n = 214).

S/ N	ITEMS	REGION	
1.	Some young people go to school hungry because there is not enough food at home. How often does this happen to you?	Rural (n=96)	Urban (n=118)
	Never	55 (64.9)	85 (81.6)
	Once in a month	4 (3.84)	10 (9.6)
	Once in a week	26 (24.96)	22 (21.12)
	Everyday	11 (10.56)	1 (0.96)
2.	Some young people go to bed hungry because there is not enough food at home. How often does this happen to you?	Rural (n=96)	Urban (n=118)
	Never	63 (74.34)	95 (91.2)
	Once in a month	5 (4.8)	11 (10.56)
	Once in a week	18 (17.28)	8 (7.68)
	Everyday	10 (9.6)	4 (3.84)

Values are presented as n (total number of samples), percent (%).

Regarding weekly fish consumption, the urban school consumed more fish ($\bar{x} = 1.77$) than the children from the rural school ($\bar{x} = 1.33$) with significant differences ($p = 0.00$, 95% CL [4.13,4.89]) and moderate effects size (Cohen's $d = 3.19$). Considering how many days of the week they usually eat dairy, urban school consume more dairy ($\bar{x} = 3.74$) than rural school children ($\bar{x} = 2.92$) with significant differences ($p = 0.00$, 95% CL [0.1,1.54]) and moderate effect size (Cohen's $d = 0.31$).

Table 5
Rural and urban differences in weekly eating habits.

S/ N	ITEMS	RURAL \bar{x} (SD)	URBAN \bar{x} (SD)	P- VALUE	95% CL	Cohen's d
1	How many days of the week did you drink at least one soft drink e.g. coke, fanta, sprite, pepsi, bigi, chapman etc.?	1.05 (0.59)	1.25 (0.62)	0.02*	[0.04,0.37]	0.38
2	How many days of the week did you drink at least one DIET fizzy drink e.g. Zobo, Kunu, Agbo or herbal drink?	0.57 (0.61)	1.12 (0.69)	0.00*	[0.38,0.73]	0.72
3	How many days of the week did you eat least one sugary snack.e.g. sweets/chocolate/cake?	1.32 (0.64)	1.64 (0.59)	0.00*	[0.15,0.48]	0.56
4	How many days of the week did you eat takeaway foods, eg. Mr. Biggs, Chicken Republic, TFC, Domino, McDonalds, KFC, Sweet Sensation, African Pot, Chinese, etc.	0.51 (0.63)	0.60 (0.74)	0.34	[-0.01,0.28]	0.20
5	How many days of the week did you eat food prepared away from home, for example in a restaurant, cafeteria, or from a street stall/Bukka?	0.65 (0.73)	0.69 (0.82)	0.71	[-0.17,0.25]	0.19
6	How many days of the week did you eat fish?	0.66 (0.48)	1.78 (0.42)	0.00*	[1.00,1.24]	3.19
7	How many days of the week did you eat meat, for example, beef, goat, pork, chicken (organ meat)	1.41 (0.72)	1.46 (0.71)	0.60	[-0.14,0.25]	0.01
8	How many days of the week did you eat processed meat, e.g. sausages, fried meat, deep-fried chicken, fried pork?	0.94 (0.77)	1.09 (0.83)	0.16	[-0.06,0.37]	0.20
9	How many days of the week do you eat dairy?	1.15 (0.74)	1.27 (0.74)	0.22	[-0.07,0.33]	0.31
10	How many meals do you usually eat per day over the last week?	1.33 (0.50)	1.34 (0.49)	0.93	[-0.13,0.14]	0.21
11	On how many days of the week do you eat breakfast?	1.81 (0.44)	1.86 (0.38)	0.43	[-0.07,0.15]	0.08

Values are presented as mean (\bar{x}) and standard deviation (SD); p value as 0.05 level of significance; CL as Confidence Interval; Cohen's d as effect size

Furthermore, poor eating habits not only lead to an unbalanced diet but are also liable to play a destructive role in the promotion of dental carries and other health problems [38]. The tendency to skip meals and replacing them with frequent snacks is another issue owing to the influence of takeout and fast food. And it is particularly prevalent among school-aged children. It was reported that skipped meals, poor lunches, snacking in between, munching in between, consuming large amounts of soft drink and salty tit-bits which reduce appetite, are the common unhealthy dietary habits observed among school aged children [39]. In developing countries, there is a double burden of under nutrition and over nutrition. This has been attributed to westernisation and reduced level physical activities in those countries [40,41].

As shown in Table 4, most of the school children had never gone to school hungry because there was no enough food at home but those of the urban areas do not go to school hungry. Similarly, the children had never gone to bed hungry because there was no enough food at home though most of the urban area never go to bed hungry. The current study agreed with a study on a review of nutrients among urban children and school achievement, which reported that children who attended school without breakfast are highly likely

to become more inattentive, lethargic, and irritable [42]. The findings of a study conducted in Indonesia revealed that children living in urban areas were more likely to be overweight, while those living in rural areas were more likely to be stunted [17]. This is because children living in urban areas frequently skip meals and go without food because their parents cannot afford to feed them.

As shown in Tables 3 and 5, children from urban school drank more soft drinks in a week compared with children from the rural school. The children from urban school also drank more diet fizzy drinks in a week than children from the rural school. The same pattern of weekly consumption for sugary snacks. Regarding the weekly consumption of fish, the urban school consumed more fish than the children from the rural schools. Considering how many days of the week they usually eat dairy, children of the urban school consume more dairy than children from the rural school. Also, a study conducted in the urban area reported that snacks are frequently consumed by school children, primarily after school and in the evening [42]. The most popular snacks are soft drinks and baked products. As a child gets older and has money to spend, he or she consumes more snacks outside of the home. Vending machines in school or other public places tend to offer soft drinks and packaged baked goods. Similarly a study showed that urban children were more likely to consume fruits than vegetables, while rural children were the exact reverse, more likely to consume vegetables than fruits [43]. The result of this finding is similar to other studies [44,45] that found out that children in urban regions consumed more soft drinks and fast food than children in rural areas.

5. Conclusion

This study looked at the previous day, weekly and daily eating habits between Nigerian children in rural and urban elementary schools. The study concluded that most of the children of the rural school ate cooked food prepared the previous day as breakfast, while most of the children of the urban school ate bread with tea, fried eggs, butter, or jam. Most of the children in both rural and urban area drank water during breakfast the previous day. Most of children in the urban school drank drinks during breakfast the previous day, compared to the rural school children. This implies that the children from the urban area are healthier as compared to that of the children from the rural area due to the reason that they readily have access to foods and have the tendency of not skipping meals although, the children from the rural community exhibited a better eating habits as they consumed more of natural foods and drink healthy unlike the children from the urban area who have access to ready-made foods including drinks.

In addition, almost all of the children attending the urban school brought packed lunch to school, which is uncommon among the rural schoolchildren. The study also found that children attending rural schools consume more fruits and vegetables the previous day than children from urban school. From the study it was concluded that children from urban school drank more soft drinks and diet fizzy drinks in a week compared with children from the rural school. This research was a pilot study (NigeriaLINX pilot project) limited to a school each from rural and urban areas with small sample from ages between seven (7) to thirteen (13) years. Healthy children were considered for the study. The researchers were unable to monitor the children by themselves; only the parents and the food and drinking habits of the sample schools.

The findings of this study could have implications for the wider African region. Nigeria is the most populous country in Africa, and its experiences can serve as a basis for understanding the eating habits of children in other African countries. Therefore, the results of this study could be used to inform interventions aimed at promoting healthy eating habits among children in other African countries with similar cultural background. The study could also provide global insight particularly for other countries beyond Africa struggling with similar issues related to children's eating habits.

The study has few limitations that need to be considered. The sample size of 214 healthy children may not be adequate to generalize the findings to the entire population of children in Lagos and Ekiti states. The exclusion of eight children due to reported disability also reduced the representativeness of the sample and the generalizability of the findings.

6. Recommendations

The following were recommended in this study:

1. Parents should pay more attention to their children diet at the elementary school stage because this will not in small measure contribute the total healthy growth of the children.
2. The Nigeria government should intensify the feeding of school children with one adequate meal in a day without limiting it to only children from the rural areas.
3. The school curriculum should include integrate adequate diet education into all school subjects as a means of intervention to minimise food related diseases among children.
4. There is need for physical activity in schools. A short duration can be set aside for sports and exercise to promote physical activities among children.
5. The government should construct or renovate the elementary school playground to help the school do more physical activity that will contribute more to their healthy lifestyle.
6. Government should organise workshop for all parents and teachers on the importance of a healthy diet and physical activity for the proper growth and healthy living of school children both in rural and urban area.

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Author contribution statement

Grace Otinwa: Conceived and designed the experiments; Performed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper. Boluwaji Jaiyesimi: Conceived and designed the experiments; Performed the experiments; Wrote the paper. Toba Bamitale: Analysed and interpreted the data. Owolabi Habeeb, Owolewa Musiliu: Performed the experiments; Wrote the paper. Data availability statement: Data will be made available on request.

Declaration of competing interest

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