Original Article

Nutritional Status and Lifestyle Patterns among Primary School Pupils in Edo State, Nigeria: Implications for Health Promotion

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ABSTRACT

Childhood nutrition and lifestyle patterns play a critical role in shaping the health and development of individuals, laying the foundation for a healthy adulthood. In Nigeria, Edo State faces a dual burden of malnutrition, with pockets of undernutrition coexisting with the rising prevalence of childhood obesity. This cross-sectional study assessed the nutritional status of primary school pupils in the State and explored lifestyle factors such as dietary habits and physical activity. Data were collected on 1805 pupils from sixteen randomly selected schools through anthropometric measurements and Administration Food Consumption Pattern Questionnaires. These data were analysed using SPSS version 23 and presented using frequency distributions, percentage distributions, mean, standard deviations, and chi-square. The study revealed that 77.0% of the respondents exhibited normal nutritional status, indicating a satisfactory outcome for a significant proportion of the school-age population. However, there was a worrisome prevalence of over-nutrition, with 14% of the pupils classified as obese 10.0% extreme tallness. Regarding dietary habits, most pupils reported consuming three meals a day, but a significant proportion relied on carbohydrate-rich foods, raising concerns about the nutritional adequacy of their diets. Regarding physical activity, a higher proportion of respondents engaged in activities during school hours, but participation was low after the school period. The study underscored the importance of addressing over-nutrition and promoting balanced diets and physical activity among primary school pupils in Edo State, Nigeria. Effective health promotion strategies must consider lifestyle preferences to improve the health and well-being of this vulnerable population to ensure a healthier future for Edo State's children.

INTRODUCTION

Childhood nutrition plays a pivotal role in shaping the health and development of individuals, setting the foundation for a healthy adulthood. Adequate nutrition during the early years is crucial for optimal growth, cognitive function, and immune system development (Black et al., 2013). Malnutrition (under-nutrition or over-nutrition) remains a significant public health concern among school-aged children in many developing countries, including Nigeria.

Undernutrition, often manifested as stunting, wasting, or micronutrient deficiencies, can lead to impaired physical growth, weakened immune systems, and diminished cognitive abilities (Black et al., 2013; UNICEF, 2021). Undernutrition during childhood can have far-reaching consequences, affecting productivity and economic outcomes later in life (Hoddinott et al., 2013). On the other hand, the prevalence of childhood obesity has been steadily increasing globally, and Nigeria is not exempted from this trend (World Health Organization, WHO, 2020; Adebimpe, 2019). Childhood obesity is associated with various health risks, including the development of non-communicable diseases such as diabetes, hypertension, and cardiovascular diseases (WHO, 2020). Additionally, obesity can have profound psychosocial effects, leading to low self-esteem and social isolation (Puhl & Heuer, 2009).

Edo State, like many regions in Nigeria, faces a dual burden of malnutrition, with pockets of under-nutrition coexisting with the rising prevalence of childhood obesity (Salami & Ojo, 2004; Ene-Obong et al., 2012; Salami & Nwabah, 2014; Ihensekhien & Salami, 2017; Umar et al., 2018; Adebimpe, 2019). This complex nutritional landscape calls for comprehensive research to assess the nutritional status of school-aged children and identify the factors contributing to undernutrition and obesity.

Understanding the determinants of childhood nutrition is essential for developing effective and targeted interventions to address these issues. Factors influencing childhood nutrition are multifaceted and encompass various aspects such as dietary habits, physical activity levels, socio-economic status, and cultural norms (Osei et al., 2018; Li et al., 2020). Exploring these factors can provide valuable insights into the unique challenges faced by school-aged children in Edo State and help inform evidence-based policies and programs to promote healthy nutritional practices and well-being.

Therefore, this study assessed the nutritional status of school-aged children in Edo State and investigated factors such as dietary patterns and physical activity levels. The findings of this study shall contribute to the existing body of knowledge on childhood nutrition in the Nigerian context and serve as a basis for designing effective strategies to improve the nutritional status and overall health of school-aged children in Edo State.

RESEARCH OBJECTIVES

This study aimed to assess the nutritional status of primary school pupils in Edo State, Nigeria, and explore lifestyle factors such as dietary habits and physical activity. Specifically, the study:

- Identified patterns of over-nutrition among primary school pupils in Edo State, Nigeria,

- Evaluated the dietary choices of primary school pupils in Edo State, Nigeria,

- Determined the level of physical activity among school-aged children in Edo State, Nigeria.

RESEARCH QUESTIONS

The study answered the following questions:

- What is primary school pupils' Nutritional Status (Anthropometric Indices) in Edo State, Nigeria?

- What are the dietary choices of primary school pupils in Edo State?

- What is the level of physical activity among school-aged children in Edo State?

RESEARCH HYPOTHESES

The following null hypotheses were tested at a 0.05 level of significance.

H_01: There is no significant relationship between dietary patterns and the nutritional status of respondents.

H_02: There is no significant relationship between physical activities and the nutritional status of respondents.

METHODOLOGY

Study Area and Design

This descriptive cross-sectional study was conducted in the three Senatorial Districts of Edo State, Nigeria. Edo State is divided into eighteen Local Government Areas (LGAs). To ensure representation from different areas, proportionate sampling technique was used to select eight LGAs, indicating 44% of the LGAs in the state. The primary schools within each LGA were stratified into rural and urban areas, and one school was randomly selected from each area. A total of sixteen primary schools participated in the study.

Study Population and Sample Size

The study population consisted of all children between the ages of 6 and 12 years attending the selected schools in the study area. The exact population could not be obtained at the time of the study. Therefore, Cochran's Formula was used to estimate the sample size as 1805, taking the expected prevalence of malnutrition (P)) to be 50%, confidence level to be 95% ($e = 0.05$), z-score for the margin of error as 1.96, and the value of effect (D) to be 5.

Sampling Method

A multistage sampling technique was employed. Eight LGAs were randomly selected from the three Senatorial Districts in the first stage. In the second stage, two schools were randomly selected from the list of schools in the selected LGAs, resulting in sixteen schools for the study. Finally, within each selected school, pupils were sampled using stratified sampling, ensuring representation from different age groups.

Data Collection

Data collection involved the measurement of anthropometric indicators such as the weight and height of each pupil. Research assistants trained in standardized measurement techniques conducted these measurements. To assess the food consumption patterns of the pupils, a Food Frequency Questionnaire (FFQ) and Food Consumption Pattern Questionnaire (FCPQ) were administered to each participant. The FFQ helped identify the frequency of food consumption, while the FCPQ provided insights into the types of food regularly consumed. Additionally, questions related to physical activity levels and other relevant factors were elicited from the pupils.

Data Analysis

Data collected for this study were analysed using two softwares: WHO Anthro plus software and SPSS version 23. WHO Anthro plus software was used to assess the nutritional status of the pupils such as weight-for-age, height-for-age, and BMI-for-age. SPSS version 23 was uased to analyse the data about the demographic information, food

frequency, comsumption pattern, and physical activities of the respondents. Descriptive statistics were used to summarize the data, and inferential statistics, such as chi-square tests, were employed to explore associations between variables. The significance level was set at $p < 0.05$ to determine statistical significance.

Ethical Considerations

Ethical clearance was obtained from the Research and Ethics Committee of the Edo State Ministry of Health before the commencement of the study. Additionally, permission was sought from the State Primary Education Board (SUPEB) and the Headmasters/Headmistresses of the selected schools. Before data collection, the study's nature, purpose, and procedure were explained to the school authorities, and informed consent was obtained from the parents or legal guardians of the participating pupils. The children also sought assent to ensure their willingness to participate in the study.

RESULTS

Nutritional Status (Anthropometric Indices) of Primary School Pupils

Research Question 1: What is primary school pupils' Nutritional Status (Anthropometric Indices) in Edo State, Nigeria?

From *Table 1*, 694 (38.4%) respondents were classified as having a normal weight-for-age z-score, while 409 (22.7%) were unclassified. The mean weight-for-age z-score was 0.5 ± 1.5. In addition, 1404 (78.0%) of the respondents had a normal height-for-age z-score, while 180 (10.0%) had extreme tallness. The mean height-for-age z-score was 0.3 ± 2.1. In terms of BMI-for-age z-score, three-quarters of the respondents, 1356 (75.1%), were classified as having a normal nutritional status, while 165 (9.1%) had extreme tallness. The mean BMI-for-age z-score was -0.3 ± 1.8. In all, a little over three-quarters of the respondents, 1398 (77.0%), had a normal nutritional status, while 248 (14%) were classified as obese.

Table 1: Nutritional status (anthropometric indices) of respondents

Variable		Frequency	Percent (%)
Weight-for-age Z-scores	Severe underweight (<-3)	11	1.0
	Moderate underweight	42	3.6
	Normal	694	60.0
	Unclassified↓	409	35.4
	Total	1156*	100
	Mean $\pm$ SD	0.5 ± 1.5	
Height-for-age Z-scores	Severe stunting (<-3)	79	4.4
	Moderate stunting	138	7.6
	Normal	1408	78.0
	Extreme tallness	180	10.0
	Total	1805*	100
	Mean $\pm$ SD	0.3 ± 2.1	
BMI-for-age Z-scores	Severe thinness (<-3)	159	8.8
	Moderate thinness	123	6.8
	Normal	1356	75.2
	Obesity	165	9.2
	Total	1803*	100
	Mean $\pm$ SD	-0.3 ± 1.8	

Keys: ** = Only valid cases for the attribute were analysed, converted to percentages based on the total valid cases and used for decision. ↓Unclassified provides the range of values for weight for age Z scores above +1 for which the WAZ anthropometric measure is inadequate.*

Source: Field Survey (2023)

Dietary Choices of Primary School Pupils

Research Question 2: What are the dietary choices of primary school pupils in Edo State, Nigeria?

From *Table 2*, about two-thirds of the respondents, 1196 (66.2%), stated that they consumed three meals a day. On the day of the questionnaire administration, the majority of the respondents, 1737 (96.2%), had eaten, with 1576 (87.3%) consuming carbohydrate-rich foods such as rice, swallow, bread, and other starches. Additionally, 1696 (94.0%) of the respondents reported having eaten Breakfast that day, while a small proportion, 81 (4.5%), stated that they had not eaten dinner the previous day.

Table 2: Dietary Patterns of Respondents

Variable		Frequency (N = 1805)	Percent (%)
How many times you eat in a day	Once	42	2.3
	Twice	243	13.5
	Thrice	1196	66.2
	Four times	324	18.0
	Have you eaten today	1737	96.2
Meal eaten today (n = 1737) *	Carbohydrates (rice, swallow, bread, and other starches)	1576	87.3
	Protein (meat, fish, dairy, poultry, beans, and others)	445	24.7
	Vitamins (vegetables and fruit)	127	7.0
	Fats/oils	241	13.4
	Ate Breakfast today	1696	94.0
Meal eaten as Breakfast (n = 1696) *	Carbohydrates (rice, swallow, bread, and other starches)	1616	89.5
	Protein (meat, fish, dairy, poultry, beans, and others)	455	25.2
	Vitamins (vegetables and fruit)	126	7.0
	Fats/oils	231	12.8
	Ate dinner yesterday	1724	95.5
If yes, specify the meal eaten as dinner (n = 1724)*	Carbohydrates (rice, swallow, bread, and other starches)	1645	91.1
	Protein (meat, fish, dairy, poultry, beans, and others)	610	33.8
	Vitamins (vegetables and fruit)	177	9.8
	Fats/oils	127	7.0
How often do they skip dinner	Always	237	13.2
	Sometimes	874	48.4
	Never	694	38.4

*Key: * = multiple responses*
Source: Field Survey (2023)

Level of Physical Activity among School-Aged Children

Research Question 3: What is the level of physical activity among school-aged children in Edo State, Nigeria?

Concerning physical activities, a higher proportion of respondents, 1234 (68.4%), engaged in physical activities during school hours. However, only 1004 (55.5%) of the respondents participated in physical activities after school hours. Furthermore, some 810 (44.9%) used a car as their means of transportation to school, while a higher proportion of 843 (46.7%) preferred walking when returning from school. A significant number of the respondents, 679 (37.6%), spent one hour or less playing video games. Additionally, 577 (32.0%) of the respondents liked jumping.

Table 3: Physical activity of respondents

Variable		Frequency (N = 1805)	Percent (%)
Engage in physical activities during school hours		1234	68.4
Engage in physical activities after school hours		1004	55.5
How they usually go to school*	Walking	735	40.7
	Car	810	44.9
	Bicycle	68	3.8
	Motorcycle	143	7.9
	Bus	11	0.7
How they usually return from school	Walking	843	46.7
	Car	736	40.8
	Bicycle	55	3.0
	Motorcycle	135	7.5
	Bus	11	0.7
Hours in a day spent watching TV	1-3	1253	69.5
	4-6	402	22.3
	>7	6	0.4
hours in a day spent on the computer	1-3	1044	57.8
	4-6	225	12.5
	>7	3	0.2

*Key: * = multiple responses*
Source: Field Survey (2023)

Relationship with Nutritional Status

Research Hypothesis 1: There is no significant relationship between dietary patterns and nutritional status of respondents.

From *Table 4*, only the frequency of skipping lunch and eating alone were significantly associated with nutritional status (p = 0.049 and 0.040, respectively).

Table 4: Relationship between dietary pattern and nutritional status of respondents

Variable		Nutritional Status			χ^2	p-value
		Underweight	Normal	Overweight		
Taken Breakfast today		153 (9)	1312 (77.4)	231 (13.6)	1.957	0.376
Number of meals per day	Once	2 (4.8)	33 (78.6)	7 (16.7)	3.331	0.766
	Twice	23 (9.5)	191 (78.6)	29 (11.9)		
	Thrice	109 (9.5)	886 (76.8)	158 (13.7)		
	Four times	25 (7.7)	249 (76.9)	50 (15.4)		
Skipping Breakfast	Always	48 (11.3)	329 (77.8)	46 (10.9)	8.945	0.097
	Sometimes	50 (7.4)	523 (77)	106 (15.6)		
	Never	57 (8.6)	510 (77.3)	93 (14.1)		
Skipping lunch	Always	22 (12.4)	124 (69.7)	32 (18)	9.518	0.049
	Sometimes	83 (8.5)	769 (79.2)	119 (12.3)		
	Never	53 (8.5)	476 (76.2)	96 (15.4)		
Skipping dinner	Always	22 (9.3)	173 (73.3)	41 (17.4)	5.867	0.210
	Sometimes	75 (9)	660 (79)	100 (12)		
	Never	60 (8.6)	530 (76.4)	104 (15)		
Eat alone		94 (10.1)	721 (77.4)	116 (12.5)	6.443	0.040

Key: χ^2 = chi-square value
Source: Field Survey (2023)

Research Hypothesis 2: There is no significant relationship between physical activities and the nutritional status of respondents.

Engaging in physical activities after school hours also showed a statistically significant relationship with nutritional status (p = 0.035), whereas engaging in physical activities during school

hours, going to school by walking, and going to school by car did not exhibit significant statistical relationships with nutritional status (p-values = 0.110, 0.115, and 0.876, respectively).

Table 5: Relationship between physical activities and nutritional status of respondents

Variable	Nutritional Status			χ2	p-value
	Underweight	Normal	Overweight		
Physical activities during School	104 (8.4)	945 (76.6)	185 (15)	4.413	0.110
Physical activities after School	93 (9.3)	748 (74.4)	164 (16.3)	12.526	0.035
Go to school by walking	61 (8.3)	558 (75.9)	116 (15.8)	4.292	0.115
Go to school by car	72 (8.9)	630 (77.8)	108 (13.3)	0.271	0.876

Key: χ2 = chi-square value
Source: Field Survey (2023)

DISCUSSION OF FINDINGS

The findings of this study provided valuable insights into the nutritional status and associated factors among school-aged children in Edo State, Nigeria. The high prevalence of malnutrition, including under-nutrition and over-nutrition, underscores the importance of addressing this critical public health issue to ensure the well-being and future health outcomes of the young population.

The findings of this study regarding the nutritional status of school-aged children in Edo State are consistent with the growing global concern over the dual burden of malnutrition. While it is encouraging that a significant proportion of the respondents exhibited normal nutritional status, the high prevalence of obesity (14%) is worrisome and warrants immediate attention. These results align with previous research highlighting the increasing trend of childhood obesity in many developing countries, including Nigeria (Ogden et al., 2014). Childhood obesity is associated with many short-term and long-term health implications that can significantly impact the well-being and quality of life of affected individuals. In the short term, obese children are at higher risk of experiencing immediate health problems such as insulin resistance, hypertension, and musculoskeletal issues (Lobstein et al., 2015). Psychosocial challenges, including low self-esteem and body image dissatisfaction, are also commonly observed in children with obesity, potentially leading to social isolation and reduced quality of life (Rancourt et al., 2016).

Furthermore, the long-term consequences of childhood obesity are of great concern, as obese children are more likely to carry excess weight into adulthood, increasing their risk of developing chronic diseases like type 2 diabetes, cardiovascular diseases, and certain cancers (Juonala et al., 2011). This places a significant burden on the healthcare system and has substantial economic implications due to decreased productivity and increased healthcare costs associated with managing obesity-related illnesses in adulthood (Wang et al., 2011). The presence of extreme tallness in some respondents also raises potential concerns regarding over-nutrition and excessive caloric intake during the growth phase. Although this study did not directly explore the dietary patterns of the respondents, previous research has shown that excessive consumption of energy-dense and nutrient-poor foods, coupled with reduced physical activity, is a significant contributing factor to childhood obesity (Pengpid et al., 2015). Policymakers and public health authorities must recognize the significance of these findings and implement evidence-based interventions to combat the rising prevalence of childhood obesity in Edo State.

On the other hand, 22.7% of the respondents were unclassified, indicating a lack of adequate growth monitoring and nutritional assessment. This underscores the importance of strengthening nutrition surveillance systems in the study area to identify and address under-nutrition on time. Undernutrition in childhood is associated with stunted growth, impaired cognitive development, and compromised immune function, leading to increased susceptibility to infections (Black et al.,

2013). Addressing undernutrition early in life is essential for optimal growth and development and can have significant implications for the child's future health and productivity. Moreover, the high prevalence of over-nutrition in combination with the presence of under-nutrition (unclassified respondents) indicates a double burden of malnutrition in the study population. This phenomenon is common in many low- and middle-income countries undergoing rapid transitions in nutrition and lifestyle patterns (UNICEF, 2020). Addressing this double burden requires comprehensive strategies that address both ends of the malnutrition spectrum.

The implications of these findings are substantial, as they underscore the urgent need for multifaceted and culturally sensitive public health interventions in Edo State. Collaborative efforts from government bodies, healthcare providers, educators, and communities are crucial in designing and implementing effective interventions to improve school-aged children's nutritional status and overall health. In light of the growing body of evidence linking childhood obesity to long-term health consequences, policymakers must prioritize preventing and managing childhood obesity. Evidence-based interventions should promote healthy dietary habits, encourage regular physical activity, and create supportive environments that facilitate healthy lifestyle choices (Glanz et al., 2015). School-based interventions that incorporate nutrition education into the curriculum and provide opportunities for physical activity can play a vital role in fostering healthier behaviours among children (O'Brien, 2021). Also, targeted efforts should be made to improve access to affordable and nutritious foods, particularly in vulnerable communities. Addressing food insecurity and promoting the consumption of diverse and nutrient-dense foods can help combat both under-nutrition and over-nutrition in the population (Khanna, 2021) since dietary patterns are key determinants of nutritional status among children. The availability of nutritious foods, such as fruits, vegetables, and protein-rich sources, can positively influence children's dietary intake and

contribute to optimal growth and development (Nicklaus, 2016). Conversely, limited access to healthy foods and the prevalence of energy-dense, nutrient-poor options can contribute to developing obesity and other diet-related chronic conditions (Swinburn et al., 2019).

The study's findings regarding food consumption patterns highlight the importance of promoting diverse and nutrient-dense diets among school-aged children in Edo State. Consuming three meals a day is a positive indicator of regular eating habits, essential for meeting the nutritional requirements of growing children (Nicklaus, 2016). However, the significant proportion of respondents consuming carbohydrate-rich foods like rice, swallow, bread, and other starches raises concerns about the nutritional quality of their diets. While carbohydrates are a valuable energy source, overemphazing these foods may lead to imbalanced nutrient intake, potentially resulting in deficiencies in essential vitamins and minerals. A balanced and varied diet that includes various food groups, such as fruits, vegetables, protein-rich sources, and whole grains, is crucial for supporting growth, development, and overall health (Kennedy et al., 2016). Interventions that promote nutrition education and emphasize the importance of a diverse diet can help improve the dietary habits of school-aged children in the region. Additionally, collaboration with schools and parents can create environments that encourage healthy eating practices and reduce the availability of unhealthy food choices on school premises.

The study's findings highlight both positive and concerning trends regarding physical activity. A higher proportion of respondents engaged in physical activities during school hours, which is encouraging and may be attributed to physical education classes and organized activities at school. However, less than half of the respondents participated in physical activities after school hours. This suggests a potential decline in physical activity levels during leisure time, which could contribute to sedentary behaviour and an increased risk of childhood obesity. Promoting

regular physical activity among school-aged children is crucial for maintaining a healthy body weight and preventing the onset of chronic diseases later in life. Encouraging active play, organized sports, and physical activities within the community can provide opportunities for children to engage in regular exercise outside of school hours (Cairney et al., 2015). Additionally, creating safe and accessible recreational spaces can facilitate physical activity participation among children in urban and rural areas.

Understanding the factors influencing physical activity engagement among school-aged children in Edo State is essential to develop targeted interventions. Barriers to physical activity may include a lack of access to safe play areas, time constraints due to household chores or academic demands, and cultural norms prioritizing academic achievements over physical activity (Chinapaw et al., 2017). On the other hand, facilitators of physical activity could involve supportive social environments, engaging and enjoyable physical activities, and parental encouragement (Ridgers et al., 2019). A multi-level approach is necessary to address the low participation in physical activities after school hours. This includes promoting physical activity awareness and education among children, parents, and educators and advocating for policies that prioritize physical education and activity in school curricula. Collaborative efforts between schools, communities, and relevant stakeholders can create environments that foster a culture of active living, promoting the overall health and well-being of school-aged children in Edo State.

Limitations and Implications of Findings for Public Health Interventions

This study has several limitations that need to be considered. First, the cross-sectional design limits our ability to establish causality between the identified factors and nutritional status. Longitudinal studies are necessary to better understand the dynamics of this population's nutritional changes over time. Additionally, the study relied on self-reported data, which may be subject to recall bias.

Despite these limitations, the findings of this study have critical implications for public health interventions in Edo State. Addressing childhood malnutrition requires a multifaceted approach that involves collaboration between the government, healthcare providers, educational institutions, and communities. Nutritional education programs should be developed and implemented to raise awareness about balanced diets and healthy eating habits. School-based interventions promoting physical activity and healthy lifestyle choices can also be crucial in preventing childhood obesity and related health issues.

CONCLUSION

In conclusion, this study highlights the high prevalence of malnutrition among school-aged children in Edo State, Nigeria. The presence of under-nutrition and over-nutrition necessitates urgent public health interventions to ensure the well-being and future health of the young population.

RECOMMENDATIONS

Based on the findings of this study, it was recommended that:

- Policymakers and public health authorities should formulate and implement evidence-based interventions to combat the rising prevalence of childhood obesity in Edo State

- Collaborative efforts from government bodies, healthcare providers, educators, and communities are crucial in designing and implementing effective interventions to improve school-aged children's nutritional status and overall health.

- School administrators and related agencies (such as the State Universal Basic Education Board) should embark on school-based interventions incorporating nutrition education into the curriculum and provide opportunities for physical activity.

- Schools and parents should collaborate to create environments that encourage healthy

eating practices and reduce the availability of unhealthy food choices on school premises.

- Private school owners, religious and non-religious organizations, and community societies should work at creating safe and accessible recreational spaces to facilitate physical activity among children in both urban and rural areas.

COMPETING INTERESTS

The authors declare no competing interest

ETHICAL CONFORMITY STATEMENT

Ethical clearance to conduct this research was obtained from the Research Ethics Committee of The Edo State Ministry of Health.

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