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Prevalence and Determinants of Childhood Obesity among Primary School Pupils in Edo State: A Cross-Sectional Study

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Abstract. Childhood obesity is a global health concern associated with various adverse health outcomes. This cross-sectional study aims to determine the prevalence of childhood obesity and explore the factors contributing to obesity among primary school pupils in Edo State, Nigeria. A multistage sampling technique was employed to select 1,805 pupils from sixteen schools in Edo State. Data on body composition, including weight, height, arm circumference, and skin folds measurements, were collected by qualified nurses and research assistants. Additionally, a food frequency questionnaire (FFQ) and a food consumption pattern questionnaire (FCPQ) were administered to assess the pupils' food consumption patterns. Statistical analyses were conducted using SPSS version 23, including frequency distributions, percentage distributions, mean, standard deviations, chi-square and independent samples t-test statistics. The study found out that 14% of pupils in the state were obese, and that skipping lunch, eating alone and engaging in physical activities after school had a significant relationship with the prevalence of obesity ($p = 0.049$, 0.040 and 0.035 respectively). Also, children in urban areas had a higher likelihood of obesity compared to those from rural areas ($p < 0.000$), while girls exhibited slightly higher prevalence of obesity compared to boys, though the difference is insignificant ($p = 0.769$). The study concluded that the prevalence of childhood obesity is high in Edo State of Nigeria, and that the determinants of this prevalence include dietary patterns, cultural factors, and gender.

Keywords: Childhood obesity, prevalence, determinants, primary school pupils, Edo State, Nigeria

1. Introduction

Childhood obesity has become a significant public health challenge with a global impact on the well-being and future health of children. It is a complex condition characterized by the abnormal accumulation of fat in adipose tissues, leading to potential impairments in the individual's overall health (World Health Organization, WHO, 2020). The organization classifies obesity as the fifth leading cause of global mortality, making it one of the greatest health challenges of the 21st century. The prevalence of childhood obesity has been increasing worldwide, affecting both developed and developing countries (Adebimpe, 2019; Mchravar, Majdzadeh, & Honarvar, 2019; Abood, Kadhem & Mohan, 2021; United Nations International Children's Emergency Fund, UNICEF, 2021). WHO (2020) also estimated that obesity tripped globally between 1975 and 2016. Under the age of 5years thirty-eight million children were obese in 2019, of which half of these children lived in Asia. This increment has also occurred equally among boys and girls.

In Nigeria, like many other countries, childhood obesity has emerged as a critical health issue. Over the years, the prevalence of childhood obesity has witnessed a steady rise, posing significant risks to the health and well-being of Nigerian children (Adebimpe, 2019; UNICEF, 2021; Salami & Ojo, 2004; Ene-Obong, Ibeanu, Onuoha & Ejekwu, 2012; Ihensekhien & Salami, 2017; Salami & Nwabah, 2014). Literature from both developed and developing countries have documented association between childhood obesity with various non-communicable diseases such as type 2 diabetes, high cholesterol and high blood pressure, joint pains, breathing problems (asthma, and obstructive sleep apnea), nonalcoholic fatty liver disease (NAFLD) psychosocial (low self-esteem, depression and anxiety) problems, which can have long-term detrimental effects on their health outcomes (WHO, 2020; Muhihi, Mpembeni, Njelekela, Anaeli, Chillo, Kubhoja...Ngarashi, 2013). These adverse effect points to the need for preventing childhood obesity, and with increasing evidence that childhood obesity often persist through adulthood (Field, Cook & Gillman, 2005; Rooney, Mathiason & Schauberger, 2011).

Edo State, located in the southern part of Nigeria, is not exempted from the growing concern of childhood obesity. However, there is a paucity of data on the prevalence and determinants of childhood obesity among primary school pupils in Edo State. Understanding the prevalence and factors contributing to childhood obesity in this specific context is essential for developing effective strategies and interventions to address the issue.

This cross-sectional study determined the prevalence of childhood obesity and explored the factors contributing to obesity among primary school pupils in Edo State. Specifically, the study investigated the influence of food consumption patterns, socio-economic status, cultural factors, and gender on the prevalence of childhood obesity. By examining these determinants, insights were gained into the unique contextual factors contributing to childhood obesity in Edo State and inform targeted interventions and policies to address the problem.

The findings of this study provided valuable insights into the prevalence and determinants of childhood obesity among primary school pupils in Edo State. These findings contributed to the existing body of knowledge on childhood obesity, specifically in the Nigerian context, and informed future interventions and policy-making aimed at reducing the prevalence of obesity among primary school pupils in Edo State.

1.2 Research Questions

- The study answered the following questions
- What is the prevalence of childhood obesity among primary school pupils in Edo State?
- What are the determinants of childhood obesity among primary school pupils in Edo State?

1.3 Research Hypotheses

- The second research question was hypothesized and the hypotheses tested at 0.05 level of significance.
- Dietary pattern is not a significant determinant of childhood obesity among primary school pupils in Edo State.
- Physical activity is not a significant determinant of childhood obesity among primary school pupils in Edo State.
- Location is not a significant determinant of childhood obesity among primary school pupils in Edo State.
- Gender is not a significant determinant of childhood obesity among primary school pupils in Edo State.

2. Research Methodology

2.1 Study Design and Setting

This cross-sectional study was conducted among primary school pupils aged 5- 16 years in Edo State, Nigeria. A multistage sampling technique was employed to select the study participants. The study included sixteen schools randomly selected from the three Senatorial Districts of Edo State. Selection was made to ensure equal representation of primary schools from both Urban and rural settings of the State.

2.2 Sample Size and Selection Technique

The sample size for this study was 1,805 pupils. Multistage sampling technique was employed in the selection process.
Eight Local Government Areas (LGAs) were randomly selected from the three Senatorial Districts of Edo State.
From the list of schools in these selected LGAs, two schools each were randomly chosen, resulting in a total 2of sixteen schools for the study.
Proportional sampling was then used to select 113 pupils from each of the sixteen schools, totaling 1808 pupils. However, only 1805 sets of responses were found to be valid and used for analysis.

2.3 Data Collection

The procedure for collecting data for this study are described below.

Anthropometric measurements: Data on body composition, including weight, height, arm circumference, and skin folds measurements, were collected by two qualified nurses and four trained research assistants. The measurements were conducted using standardized procedures to ensure accuracy and reliability in a dedicated room at each school with children wearing light clothes with no shoes. The pupils' weight was measured using a calibrated digital scale, while height was measured using a stadiometer. Arm circumference and skin folds measurements were taken using appropriate measuring tapes and skinfold calipers, respectively.

Food consumption patterns: To assess the pupils' food consumption patterns, a food frequency questionnaire (FFQ) and a food consumption pattern questionnaire (FCPQ) were administered. The FFQ

gathered information on the frequency of consumption of specific food items, while the FCPQ assessed the overall food consumption patterns of the pupils. The questionnaires were designed to capture relevant information on the types of food consumed, portion sizes, and meal frequencies.

Socio-demographic information: A structured questionnaire was used to collect socio-demographic information from the participating pupils.

2.4 Data Analysis

The collected data were entered into a database and analyzed using SPSS version 23. Descriptive statistics including frequency and percentage distributions were used to describe the general characteristics of the socio-demographic characteristics of the respondents. The relationships between childhood obesity and dietary pattern as well as physical activities were assessed using chi-square, while the difference in obesity by location and gender was tested by independent samples t-test statistics.

2.5 Ethical Considerations

Ethical approval for the study was obtained from the Research Ethics Committee of The Edo State Ministry of Health. Informed consent was obtained from the heads of the selected schools, as well as from the parents or guardians of the participating pupils. The nature, purpose, and procedures of the study were explained to the heads, parents, and pupils, and their voluntary participation was ensured. Confidentiality and anonymity were maintained throughout the data collection process.

3. Results

3.1 Socio-demographic Characteristics of Respondents

Table 1: Frequencies and Percentages of Respondents' Socio-demographic Characteristics

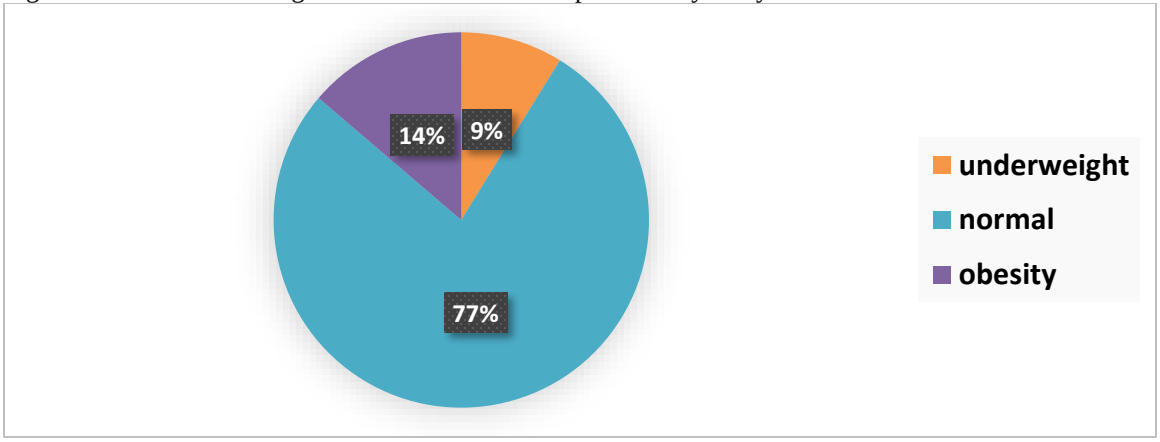
Variable	Frequency	Percent (%)
Age in years		
5 years and below	43	2.4
6 – 10 years	1115	61.8
11 – 15 years	645	35.7
16 – 20 years	2	0.1
Gender		
Male	889	49.3
Female	916	50.7
Location		
Rural	312	17.3
Urban	1403	77.7
Religion		
Christianity	1620	89.7
Islam	163	9.1
ATR	22	1.2
Ethnicity		
Benin	608	33.7
Ibo	278	15.4
Etsako	241	13.4
Yoruba	191	10.6

Esan	159	8.8
Delta	116	6.4
Others	212	3.8

The study included a total of 1805 respondents, out of which the majority were in the age group of 6-10 years (61.8%) of the participants. The respondents were almost equally distributed along gender line with 50.7% female and 49.3% male. Larger proportion of the respondents were living in urban areas (77.7%), Christians by religion (89.7%) and Benin by ethnicity (33.7%).

Research Question 1: What is the prevalence of childhood obesity among primary school pupils in Edo State?

Figure 1: Pie Chart showing Nutritional Status of Respondents by Body Mass Index



The prevalence of childhood obesity among primary school pupils in Edo State was determined based on the collected data. The analysis revealed that out of the 1,805 pupils included in the study, 14% were classified as obese, based on body mass index (BMI) percentiles for age and sex. This indicates a significant burden of childhood obesity in the study population.

Research Hypothesis 1: Dietary pattern is not a significant determinant of childhood obesity among primary school pupils in Edo State.

Table 2: Chi-Square Statistics of Relationship between Dietary Pattern and Childhood Obesity among Primary School Pupils in Edo State

Variable	Obesity $\bar{x}$(%)	$\chi 2$	P-value
Ate Breakfast today			
Yes	231 (13.6)	1.957	0.376
No	17 (17.9)		
Number of times meals eaten in a day			
Once	7 (16.7)	3.331	0.766
Twice	29 (11.9)		
Thrice	158 (13.7)		
Four times	50 (15.4)		
How often they skip breakfast			
Always	46 (10.9)	8.945	0.097
Sometimes	106 (15.6)		
Never	93 (14.1)		
How often they skip lunch			

Always	32 (18)	9.518	0.049
Sometimes	119 (12.3)		
Never	96 (15.4)		
How often they skip dinner			
Always	41 (17.4)	5.867	0.210
Sometimes	100 (12)		
Never	104 (15)		
Eat alone			
Yes	116 (12.5)	6.443	0.040
No	131 (15.5)		

The association between childhood obesity and dietary pattern was explored. Table 2 showed that dietary patterns played a significant role in the prevalence of obesity among primary school pupils. Pupils who reported skipping lunch and eating alone had a higher likelihood of being obese compared to those who followed a balanced and healthy diet ($p = 0.049$ and 0.040 respectively).

Research Hypothesis 2: Physical activity is not a significant determinant of childhood obesity among primary school pupils in Edo State.

Table 3: Chi-Square Statistics of Relationship between Physical Activity and Childhood Obesity among Primary School Pupils in Edo State

Variable	Obesity $\bar{x}$(%)	$\chi 2$	P-value
Engaging In Physical Activities During School Hours			
Yes	185 (15.0)	4.413	0.110
No	63 (11.5)		
Engaging In Physical Activities After School Hours			
Yes	164 (16.3)	12.526	0.035
No	84 (10.8)		
Go to school by walking			
Yes	116 (15.8)	4.292	0.115
No	132 (12.4)		
Go to school by car			
Yes	108 (13.3)	0.271	0.876
No	140 (14.2)		

In terms of physical activities, Table 3 shows that engaging in physical activities after school hours had a statistically significant relationship with the prevalence of obesity ($p = 0.035$).

Research Hypothesis 3: Location is not a significant determinant of childhood obesity among primary school pupils in Edo State.

Table 4: Independent Samples t-test Statistics of Difference in Prevalence of Childhood Obesity by Location

Dependent Variable	Location	N	Mean	SD	T	df	Sig. (2-tailed)
Obesity Status	Rural	312	0.058	0.234	-4.606	1713	0.000*
	Urban	1403	0.157	0.364			

*Significant at 0.05

Location is a cultural factor was also found to influence the prevalence of childhood obesity. Pupils living in urban areas where dietary practices that promote high-fat and high-sugar foods are prevalent had a higher likelihood of obesity compared to those from rural areas with healthier dietary traditions ($p<0.000$).

Research Hypothesis 4: Gender is not a significant determinant of childhood obesity among primary school pupils in Edo State.

Table 5: Independent Samples t-test Statistics of Difference in Prevalence of Childhood Obesity by Gender

Dependent Variable	Sex	N	Mean	SD	T	df	Sig. (2-tailed)
Obesity Status	Male	889	0.135	0.341	-0.293	1803	0.769
	Female	916	0.140	0.347			

A shown in Table 5, gender differences were observed in the prevalence of childhood obesity, with girls exhibiting a slightly higher prevalence compared to boys, although the difference was not statistically significant ($p=0.769$).

4. Discussion on the findings

The prevalence of childhood obesity among primary school pupils in Edo State was found to be 14% in this study. This finding is consistent with previous research conducted in Nigeria, which has reported high rates of childhood obesity (Adebimpe, 2019; UNICEF, 2021; Ene-Obong, *et al*, 2012; Ihensekhien & Salami, 2017; Salami & Nwabah, 2014). The high prevalence of childhood obesity is of great concern, as it is associated with various adverse health outcomes and can have long-term implications for the well-being of individuals.

One of the key findings of this study is the significant association between dietary patterns and childhood obesity. This study found out that there is a relationship between prevalence of obesity and skipping of meals as well as exercise or play after school. The promotion of healthy eating habits, including the consumption of fruits, vegetables, and whole grains, should be a priority in interventions aimed at reducing childhood obesity (World Health Organization, WHO, 2016).

Cultural factors were also found to influence the prevalence of childhood obesity among primary school pupils in Edo State. Pupils belonging to cultural groups with traditional dietary practices that promote high-fat and high-sugar foods had a higher prevalence of obesity. Pupils in urban areas may have more frequent consumption of high-calorie but nutrient-poor foods, and are at a higher risk of being obese. This finding aligns with the global trend of increased consumption of processed and unhealthy foods, which are often high in saturated fats, sugars, and salt. Cultural norms and traditions play a significant role in shaping dietary habits and lifestyle behaviors. Interventions aimed at reducing childhood obesity should take into account cultural diversity and work towards promoting healthier cultural dietary practices (Pérez-Escamilla, Obbagy, Altman, Essery, McGrane, & Wong, 2012).

Gender differences were observed in the prevalence of childhood obesity, with girls exhibiting a slightly higher prevalence compared to boys, although the difference was not statistically significant. This finding is consistent with previous studies that have reported similar gender patterns of obesity among children (Ihensekhien & Salami, 2017; Salami & Nwabah, 2014). The reasons behind these gender differences in obesity prevalence are multifactorial and may include differences in physical activity levels, dietary preferences, and hormonal factors (Wijnhoven, van Raaij, Spinelli, Rito, Hovengen, Kunesova…Yngve, 2014).

The findings of this study have important implications for public health interventions and policy-making. The high prevalence of childhood obesity in Edo State calls for urgent action to address this issue. Interventions should focus on promoting healthy eating habits, improving access to nutritious foods, addressing socio-economic disparities, and considering cultural factors in the design of interventions. School-based interventions that promote physical activity, healthy eating, and health education have shown promising results in reducing childhood obesity (Kropski, Keckley, & Jensen, 2013).

5. Conclusion

This study provides valuable insights into the prevalence and determinants of childhood obesity among primary school pupils in Edo State. The high prevalence of childhood obesity, along with the significant associations with food consumption patterns, socio-economic status, cultural factors, and gender, underscores the urgent need for comprehensive interventions and policies to address this public health concern. By targeting modifiable

risk factors and promoting healthy behaviors, it is possible to reduce the prevalence of childhood obesity and improve the overall health and well-being of children.

6. Recommendations

Based on the findings of this study, the following recommendations can be made:

Implement comprehensive school-based interventions: Schools play a crucial role in promoting healthy behaviors among children. Interventions should focus on providing nutrition education, promoting physical activity, and creating supportive environments that encourage healthy eating habits and active lifestyles. Collaboration between schools, parents, and healthcare professionals is essential for the successful implementation of such interventions.

Address socio-economic disparities: Efforts should be made to reduce socio-economic disparities that contribute to childhood obesity. This can include initiatives to improve access to affordable, nutritious foods in lower-income communities and the provision of opportunities for physical activity, such as recreational facilities or after-school programs. Additionally, policies should aim to improve the economic well-being of families, as poverty can limit resources for healthy food choices.

Promote culturally sensitive interventions: Cultural factors influence dietary habits and lifestyle behaviors. Interventions should take into account the cultural diversity within the population and promote culturally sensitive approaches to addressing childhood obesity. This can involve working closely with community leaders, incorporating traditional dietary practices into nutrition education programs, and developing interventions that align with cultural values and norms.

Conduct longitudinal studies: Future research should employ longitudinal study designs to better understand the causal relationships between the identified factors and childhood obesity. Longitudinal studies can provide insights into the temporal sequence of events and help identify critical periods for intervention. Additionally, objective measures of food consumption and physical activity should be utilized to minimize bias in self-reported data.

Explore other potential determinants: While this study examined several important determinants of childhood obesity, there are other factors that could contribute to obesity risk, such as genetic predisposition, parental influences, and environmental factors. Further research should investigate these potential determinants to gain a more comprehensive understanding of the complex nature of childhood obesity.

Evaluate the effectiveness of interventions: It is important to assess the impact and effectiveness of interventions targeting childhood obesity. Conducting evaluations of existing programs and interventions can provide insights into their effectiveness, identify areas for improvement, and inform future interventions and policy-making.

7. Implications for Further Studies

This study contributes to the existing body of knowledge on childhood obesity by providing insights into the prevalence and determinants of obesity among primary school pupils in Edo State. However, further research is warranted to address the following areas:

Regional and National Studies: While this study focused on Edo State, conducting similar research in other regions or at the national level would provide a broader understanding of the prevalence and determinants of childhood obesity in Nigeria. This would allow for comparisons between different regions and provide a more comprehensive picture of the problem.

Long-term follow-up studies: Longitudinal studies with extended follow-up periods are needed to assess the persistence and long-term effects of childhood obesity. Such studies can help identify the trajectory of obesity into adolescence and adulthood and examine the associated health consequences.

Intervention Studies: Conducting intervention studies to evaluate the effectiveness of specific interventions in reducing childhood obesity is crucial. These studies should assess the impact of interventions targeting food consumption patterns, socio-economic factors, cultural influences, and gender disparities. Evaluating the effectiveness of interventions will provide valuable evidence for the development of evidence-based strategies to combat childhood obesity.

Exploration of novel determinants: Further research should explore other potential determinants of childhood obesity, such as genetic factors, parental influences, environmental factors, and the impact of the built environment. Understanding these additional determinants can contribute to the development of

comprehensive interventions and policies to address childhood obesity effectively.

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