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Urban–Rural Disparities in the Prevalence and Determinants of Childhood Obesity Among Adolescents Aged 10–19 Years in Delta South Senatorial District, Nigeria

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ABSTRACT

Background: Childhood obesity is a growing public health concern, especially in low- and middle-income countries like Nigeria. Limited data exist on its prevalence and associated risk factors in many regions.

Objectives: To assess and compare the prevalence of childhood obesity among adolescents aged 10–19 years in urban and rural communities of Delta South Senatorial District, Delta State, Nigeria.

Methods: A cross-sectional study was conducted from February to July 2024 across 21 schools using multistage sampling. A total of 1,250 adolescents were recruited; 1,178 were eligible for analysis. Data were collected using structured questionnaires and anthropometric measurements. BMI was calculated and classified using International Obesity Task Force (IOTF) cut-offs. Data were analyzed using SPSS version 26, with Chi-square for categorical variables.

Results: The overall obesity prevalence was 15.3%; overweight and underweight were 21.7% and 21.6%, respectively. Urban adolescents had significantly higher obesity rates (17.3%) than rural counterparts (10.2%) ($p < 0.05$). Females represented 61.0% of obese cases. Unhealthy dietary habits, including high consumption of fast foods (60.6%) and sugary beverages (61.5%), were more common among urban respondents. Adolescents with poor diets were 2.45 times more likely to be obese (95% CI: 1.68–3.56), and those with <60 minutes of daily physical activity had 82% increased risk (OR = 1.82; 95% CI: 1.29–2.57).

Conclusions: The high prevalence of obesity among adolescents, particularly in urban areas, highlights the role of unhealthy diets and physical inactivity. Targeted school-based interventions and food policy regulations are urgently needed.

Keywords: *Childhood obesity, adolescents, urbanization, dietary habits, physical inactivity, public health, Nigeria*

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INTRODUCTION

Childhood obesity has become a significant global public health concern, with its prevalence rising at alarming rates in both developed and developing countries. The World Health Organization (WHO) estimates that over 340 million children and adolescents aged 5–19 years were overweight or obese in 2016, representing a more than fourfold increase from 1975.[1] Obesity during childhood is associated with both immediate and long-term health complications, including type 2 diabetes (T2D), hypertension, cardiovascular diseases, dyslipidemia, and certain types of cancer.[2,3] Beyond its physical health implications, childhood obesity also significantly affects mental health, contributing to depression, anxiety, social stigmatization, and poor self-esteem.[4]

The burden of childhood obesity is increasingly shifting to low- and middle-income countries (LMICs), where the dual burden of undernutrition and obesity coexists. Rapid urbanization, globalization, and economic transitions have fueled dietary shifts from traditional, nutrient-rich diets to high-calorie, processed foods.[5] In Nigeria, urbanization rates have accelerated in recent decades, with the urban population increasing from 35% in 1990 to over 50% in 2020.[6] This demographic shift has contributed to significant changes in dietary patterns, physical activity levels, and overall lifestyle behaviors, particularly among adolescents.[7]

Although several studies have reported on the prevalence of childhood obesity in Nigeria, much of the existing literature focuses on metropolitan areas such as Lagos, Abuja, and Ibadan.[8,9] There is a paucity of data on childhood obesity in Delta State, particularly in Delta South Senatorial District, despite its unique sociocultural and economic landscape. Delta South is characterized by a mix of urban and rural communities, with varying levels of socioeconomic development, dietary practices, and exposure to globalization. Urban areas such as Warri South and Isoko North have experienced rapid industrialization, increased availability of fast foods, and widespread sedentary lifestyles, while rural areas like Warri North and Bomadi continue to maintain more traditional dietary patterns based on locally available foods such as cassava, yams, and vegetables.[10]

However, even in rural areas, dietary and lifestyle transitions are becoming increasingly prevalent due to globalization and market integration. This gradual shift exposes rural communities to energy-dense, processed foods, creating a nutrition transition that places these populations at risk of obesity and related comorbidities.[11] The urban-rural divide in Delta South Senatorial District provides a unique opportunity to explore how environmental, dietary, and socioeconomic factors shape obesity risk among adolescents.

Adolescents aged 10–19 years represent a particularly vulnerable population due to the physiological and behavioral changes that occur during this developmental stage. This period is marked by rapid growth, hormonal changes, and the establishment of lifelong dietary and physical activity habits.[12]. Research suggests that children who develop obesity during adolescence are at significantly higher risk of becoming obese adults, with increased susceptibility to cardiovascular diseases, type 2 diabetes, and metabolic syndrome later in life.[13]

Additionally, adolescents are more likely to engage in independent food choices and sedentary behaviors, particularly in urban environments where digital technology and screen-based activities are increasingly prevalent.[14] Despite these vulnerabilities, few studies in Nigeria have focused specifically on this age group, further underscoring the need for region-specific data.
Given the lack of comprehensive data on childhood obesity in Delta South Senatorial District, this study aims to determine the prevalence of childhood obesity among adolescents aged 10–19 years and examine its key determinants, including dietary habits, physical activity levels, and socioeconomic factors. By addressing these gaps, the study will provide valuable insights to guide community-based interventions, school health programs, and policy recommendations tailored to the unique needs of the region.

MATERIALS AND METHODS

Study Design

A cross-sectional study design was adopted to determine the prevalence of childhood obesity and its associated determinants among adolescents aged 10 - 19 years in Delta South Senatorial District, Delta State, Nigeria. This design was chosen to provide a snapshot of the current prevalence of obesity and associated risk factors within the target population at a specific point in time, making it suitable for assessing disease burden and identifying potential determinants.

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Study Area

The study was conducted in Delta South Senatorial District, located in Delta State, Nigeria, which comprises eight Local Government Areas (LGAs), including Warri South, Warri North, Isoko North, Isoko South, Patani, Bomadi, Burutu, and Warri South-West. The district presents a unique blend of urban and rural communities, making it an ideal setting to examine how socioeconomic and dietary difference influence childhood obesity.

Urban areas such as Warri South and Isoko North are characterized by higher socioeconomic status, with greater access to formal education, healthcare services, and employment opportunities. These areas have a greater availability of fast-food outlets, supermarkets, and processed foods, which often replace traditional diets with energy-dense, nutrient-poor foods such as sugary beverages, snacks, and fried foods.[5] The rapid pace of industrialization and urbanization in these areas encourages sedentary lifestyles, with children spending more time on screen-based activities and engaging in fewer outdoor physical activities.

In contrast, rural areas such as Warri North, Bomadi, and Patani have lower socioeconomic indicators, with many families relying on subsistence farming and fishing for their livelihoods. Dietary patterns in these communities are predominantly based on traditional staple foods like cassava, yams, vegetables, and local fish, which are often more nutrient-rich but less energy-dense.[11] However, increasing exposure to market globalization has led to a gradual shift towards processed foods even in rural communities, posing a rising risk of obesity.

These socioeconomic and dietary disparities are highly relevant to childhood obesity because they shape both food availability and lifestyle behaviors. Children from higher-income urban households are more likely to consume energy-dense diets and engage in sedentary activities, while those from lower-income rural households may have better access to traditional foods but face rising exposure to processed foods. Additionally, access to health information, healthcare services, and recreational facilities differs significantly between urban and rural areas, potentially influencing obesity prevention and management strategies in these settings.

Study Population

The study population comprised adolescents aged 10–19 years enrolled in public and private secondary schools within Delta South Senatorial District, Delta State, Nigeria. The selection of participants was designed to ensure a representative sample across both urban and rural communities.

A total of 25 schools were initially approached, including 15 urban schools and 10 rural schools. Of these, 21 schools (84%) agreed to participate in the study (13 urban schools and 8 rural schools), while 4 schools declined participation due to logistical constraints and academic scheduling conflicts.

To enhance participation and ensure representative coverage, school authorities were engaged through preliminary meetings where the purpose of the study was explained. Information sheets and consent forms were distributed to parents and guardians through the school management. Only students who returned signed parental consent forms and gave their assent were included in the study.

This approach helped to minimize selection bias and ensured that the study captured a diverse range of socioeconomic backgrounds, dietary practices, and physical activity patterns within the study area.

Sample Size Determination

Given that the study was designed to compare the prevalence of childhood obesity between urban and rural adolescents, the sample size was calculated for a comparative cross-sectional study based on the formula for comparing two proportions:[15]:

$n = (Z_{1 - alpha/2} + Z_1 - beta)^2 . [P_1(1 - P\_1) + P_2(1 - P_2)]/(P_1 - P_2)^2$

Where:

$Z_{1 - alpha/2}$ for 95% confidence

Z_1 - beta for 80% power

P_1 = estimated obesity prevalence in urban adolescents = 19.8% (see ref. below)[16]

P_2 = estimated obesity prevalence in rural adolescents = 10.1% (see ref. below)[16]

$P_1 - P_2$ = minimum detectable difference

Substituting, n = 211 per group

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Thus, a minimum of 211 participants per group (urban and rural) was required, yielding a total sample size of 422.

To account for potential non-responses, incomplete questionnaires, and data quality issues, a 20% adjustment was applied:

422+ (0.20 × 422) = 506

However, to improve representativeness across multiple LGAs, school types, and demographic subgroups, the final sample size was increased to 1,250 participants. This expansion ensured sufficient power for subgroup analyses and enhanced the generalizability of findings across the urban and rural populations within Delta South Senatorial District.

Sampling Technique

A multistage sampling technique was employed to select participants for the study, ensuring a representative sample across both urban and rural communities in Delta South Senatorial District. The sampling process involved three stages, with careful consideration of geographical location, school type.

Study Population and Sampling Stages

The study population consisted of adolescents aged 10–19 years enrolled in public and private secondary schools within Delta South Senatorial District, Delta State, Nigeria. This region comprises both urban and rural communities, making it suitable for assessing geographical disparities in obesity prevalence and determinants. Only students who had lived in the area for at least six months and met the inclusion criteria were eligible.

The sampling process involved three distinct stages:

Stage 1: Selection of Local Government Areas (LGAs)

Sampling Frame: All eight LGAs within Delta South Senatorial District (Warri South, Warri North, Isoko North, Isoko South, Patani, Bomadi, Burutu, and Warri South-West)

Methodology: Four LGAs were purposively selected based on urban–rural classification and accessibility:

Urban LGAs: Warri South and Isoko North

Rural LGAs: Warri North and Bomadi

Sampling Result: Two LGAs each were chosen to represent urban and rural communities, ensuring a balanced geographical comparison.

Stage 2: Selection of Schools

Sampling Frame: All registered public and private secondary schools in the selected LGAs**.**

Methodology: Schools were first stratified by location (urban or rural) and then by type (public or private).

A total of 25 schools were sampled (15 urban and 10 rural) proportionately based on estimate from State's Ministry of Basic and Secondary Education.

21 schools (84%) agreed to participate: 13 urban schools and 8 rural schools.

Selection within each stratum was purposive and convenience-based, guided by school size, accessibility, and willingness to participate.

Sampling Result:

Urban Schools: 13 schools (e.g., Hussey College, Warri; Delta Careers College, Warri; Ogberikoko Secondary School, Warri).

Rural Schools: 8 schools (e.g., Bomadi Secondary School, Bomadi; Koko Model Secondary School, Koko; Kpakiama Grammar school, Bomadi).

This ensured both public and private institutions were represented in each geographic category.

Stage 3: Selection of Participants

Sampling Frame: The complete student enrollment registers of the selected schools served as the sampling frame.

Methodology: Within each school, systematic random sampling was applied using a sampling interval of every 5th student on the class registers.

The starting point was randomly selected for each class (using the class register), and adjustments were made to account for absenteeism or lack of parental consent.

Prior to selection, informational sessions were held with students, and informed consent forms were distributed and returned by parents or guardians**.**

Sampling Result: A total of 1,250 adolescents were initially sampled.

After excluding participants due to incomplete questionnaires (n = 31), missing anthropometric data (n = 15), and withdrawn consent (n = 26), 1,178 students (94.2%) were retained for final analysis.

Justification for Stratification

Stratifying by school location and type ensured diverse representation across different socioeconomic backgrounds and living environments. Public schools generally enrolled students from lower-income families,

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whereas private schools served more affluent populations. This stratification enabled the study to explore the interplay between urbanization, school environment, and obesity risk among adolescents.

Inclusion and Exclusion Criteria

Inclusion Criteria: Adolescents aged 10 - 19 years. Participants who had lived in the study area for at least six months preceding the study and had **not** participated in organized exercise programs. Adolescents without known chronic illnesses or conditions affecting growth and weight. Participants who provided parental consent and assented were included.

Exclusion Criteria: Adolescents who had participated in organized exercise programs within six months before the study. Adolescents with chronic illnesses or conditions affecting growth. Those who declined to provide consent or assent were excluded.

Data Collection Instruments

Data were collected using a structured questionnaire and anthropometric measurements to obtain information on the participants' socio-demographic characteristics, dietary habits, physical activity levels, and obesity risk factors. The data collection instruments were carefully designed to ensure validity, reliability, and reproducibility of the study findings.

Questionnaire Development and Validation

The questionnaire was adapted from standardized tools used in previous studies on childhood obesity (1, 2) and tailored to suit the sociocultural context of the study area. The questionnaire comprised four sections: 1. Socio-demographic information (age, sex, school type, parental occupation, and education level), **2.** Dietary habits (frequency of consumption of sugary beverages, fast foods, snacks, fruits, and vegetables), 3. Physical activity patterns (hours spent on screen-based activities, participation in sports, and daily walking), 4. Perceptions of body image and obesity awareness

Validation Process:

The content validity of the questionnaire was assessed through a panel of experts in nutrition, public health, and epidemiology from Novena University. The experts reviewed the questionnaire for clarity, cultural relevance, and comprehensiveness.

A pilot study was conducted among 50 participants selected from Otagbu-Ogbe Grammar School (Urban) and Amai Secondary Commercial School (Rural) to assess the face validity, clarity, and feasibility of the instrument. Participants were selected using convenience sampling. Feedback from the pilot study led to minor modifications, such as simplifying language for easier understanding.

Reliability Test:

Internal consistency of the questionnaire was measured using Cronbach's alpha coefficient, which yielded a value of 0.78 for the dietary habits section and 0.81 for the physical activity section, indicating acceptable to good reliability.[17]

Anthropometric Measurements

Anthropometric data were collected to calculate Body Mass Index (BMI) and classify participants' weight status according to the International Obesity Task Force (IOTF) cut-off points. The following equipment was used:

Weight: Electronic digital weighing scale (SECA 803, Germany) with a precision of 0.1 kg

Height: Portable stadiometer (SECA 213, Germany) with a precision of 0.1 cm

Waist Circumference: Non-stretchable measuring tape (SECA 201)

All measurements were taken following WHO standard protocols.[4] The weighing scale was calibrated daily before use to ensure accuracy.

Measurement of Perception of Obesity Determinants

Adolescents' perception of obesity determinants was assessed using a structured set of 5 items related to dietary habits, physical activity, and obesity awareness. Each item used a 3-point Likert scale: Agree (2 points), Neutral (1 point), and Disagree (0 points). The total perception score ranged from 0 to 10.

Perception was categorized as:

Positive perception: score ≥ 6

Negative perception: score < 6

This threshold reflects a minimum of 60% correct or health-supportive responses, which is commonly used in perception studies.

Content validity was established through expert review, and reliability testing during the pilot study yielded a Cronbach's alpha of 0.76, indicating acceptable internal consistency.

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Pilot Study Participants

The results from the pilot study were not included in the final dataset but were used to refine the data collection instruments.

Ethical Considerations

Ethical approval for this study was obtained from the Novena University Ethics Review Board with approval reference number NUO/PG/PhD/ERB/25/008. Written informed consent was obtained from the parents or legal guardians of all participants, while adolescents provided assent before participating. Participants and their guardians were provided with detailed information sheets explaining the study's objectives, procedures, potential risks, and benefits. The voluntary nature of participation and the right to withdraw at any time without penalty were emphasized.

To ensure privacy and confidentiality, each participant was assigned a unique identification code. All collected data were anonymized, with no personal identifiers included. Hard copy data were stored in locked cabinets accessible only to the research team, while digital data were stored on password-protected computers with AES-256 encryption. Only the principal investigator and authorized research assistants had access to the data. Research team members signed confidentiality agreements to uphold data privacy standards.

Participants who were identified as overweight or obese during anthropometric measurements were referred to the school health officers for appropriate health education and counseling. The study adhered to the ethical principles outlined in the Declaration of Helsinki and Nigeria's National Code of Health Research Ethics.

Data Analysis

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 26.0 for Microsoft Windows 11. Descriptive statistics (frequencies and percentages) were used to summarize participants' socio-demographic characteristics, dietary habits, physical activity levels, and weight status.

The Chi-square test (χ^2) was employed to assess associations between categorical variables, including geographical location (urban vs. rural), sex, school type, and obesity prevalence, as well as behavioral factors such as dietary habits, screen time, and physical activity levels. Statistical comparisons were limited to categorical associations.

A p-value of <0.05 was considered statistically significant for all analyses.

Quality Assurance

To ensure the accuracy, consistency, and reliability of data collected, comprehensive quality assurance measures were implemented throughout the study.

Field staff, including research assistants and health personnel, underwent a two-day intensive training session prior to data collection. The training covered:

Study objectives and ethical considerations

Proper administration of the questionnaire

Standardized procedures for measuring weight, height, and waist circumference

Calibration and handling of anthropometric equipment

Techniques for minimizing measurement errors

Ensuring participant privacy and confidentiality

The effectiveness of the training was evaluated through practical demonstrations and mock data collection exercises, followed by an assessment test. Only participants who demonstrated competency in questionnaire administration and anthropometric measurements were certified to participate in the fieldwork.

Anthropometric tools, including the SECA 803 digital weighing scale and SECA 213 portable stadiometer, were calibrated before each measurement session using standard weights and rulers. If any discrepancies were detected, the equipment was re-adjusted or replaced as necessary. The principal investigator conducted routine spot checks to ensure that field staff adhered strictly to standardized protocols.

Study Scope

This study focused on determining the prevalence of childhood obesity and its associated dietary, physical activity, and socioeconomic determinants among adolescents aged 10 - 19 years in Delta South Senatorial District, Delta State, Nigeria. The scope encompassed both urban and rural communities, providing insights into how environmental and lifestyle factors contribute to obesity within the region.

While the multistage sampling technique ensured a representative sample, the selection of participants from school-based populations may have excluded out-of-school adolescents, potentially limiting the generalizability of the findings. Additionally, reliance on self-reported dietary habits and physical activity patterns could introduce recall bias or social desirability bias.

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The study's cross-sectional design provides a snapshot of the current prevalence of childhood obesity but does not establish causal relationships between risk factors and outcomes. Despite these limitations, the robust sampling method, standardized data collection procedures, and quality assurance measures enhance the validity and reliability of the findings.

Future studies involving longitudinal designs and a more inclusive population could provide deeper insights into the long-term determinants and health outcomes of childhood obesity in the region.

RESULTS

Socio-demographic Characteristics of Students by Geographical Location

Most participants (69.7%) were aged 14–17 years. A higher proportion of urban students were females (60.9%), while rural participants showed nearly equal gender distribution. Playing computer games was the most common activity (56.1%), with rural students more involved in farming. Private school attendance was predominant in urban areas (86.3%), unlike rural areas where public schools dominated (71.1%).

Table 1: Socio-Demographic Characteristics of Students by Geographical Location

Variable	Total (n=954)	Urban (n=670)	Rural (n=284)	p-value
Age Group (years)				
10–13	127 (13.3%)	80 (11.9%)	47 (16.5%)	0.042
14–17	665 (69.7%)	469 (70.0%)	196 (69.0%)	
18–20	162 (17.0%)	121 (18.1%)	41 (14.4%)	
Sex				0.056
Male	402 (42.1%)	262 (39.1%)	140 (49.3%)	
Female	552 (57.9%)	408 (60.9%)	144 (50.7%)	
Extra Academic Activities				<0.001
Farming	136 (14.3%)	67 (10.0%)	69 (21.5%)	
Playing computer games	535 (56.1%)	392 (58.5%)	143 (50.4%)	
Learning skills	79 (8.3%)	58 (8.7%)	21 (10.2%)	
No activity	204 (21.4%)	153 (22.8%)	51 (18.0%)	
School Type				<0.001
Private	660 (69.2%)	578 (86.3%)	82 (28.9%)	
Public	294 (30.8%)	92 (13.7%)	202 (71.1%)	

Prevalence of Weight Status Among Adolescents in Delta South Senatorial District

Urban adolescents had higher rates of overweight (15.1%) and healthy weight (24.3%), while rural adolescents had significantly higher rates of underweight (15.2%). The difference in weight distribution by location was statistically significant ($p < 0.05$).

Table 2: Prevalence of Weight Status Among Adolescents in Delta South Senatorial District

Weight Status	Rural (n=203)	Urban (n=394)	Total (N=597)
Underweight (<18.5)	145 (15.2%)	13 (1.3%)	158 (26.5%)
Healthy Weight (18.5–24.9)	6 (0.6%)	232 (24.3%)	238 (39.9%)
Overweight (25.0–29.9)	50 (5.2%)	144 (15.1%)	194 (32.5%)
Obese (>30.0)	2 (0.2%)	5 (0.5%)	7 (1.2%)
Total	203 (34.0%)	394 (66.0%)	597 (100%)

Chi-square (χ^2) = 1338.170, df = 3, $p < 0.001$

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Urban–Rural Comparison of Lifestyle Behaviors Among Adolescents

Table 3 highlights significant differences in obesity-related lifestyle behaviors between urban and rural adolescents. Urban students reported much higher frequencies of fast-food consumption (60.6% vs. 23.2%; $\chi^2 = 129.780$, $p < 0.001$) and daily intake of sugary beverages (61.5% vs. 44.0%; $\chi^2 = 25.860$, $p < 0.001$). Similarly, low intake of fruits and vegetables was more common in urban settings (67.6% vs. 58.1%; $\chi^2 = 6.350$, $p = 0.012$), further suggesting dietary disadvantage in these environments.

Urban adolescents were also significantly more likely to engage in physical inactivity (74.2% vs. 28.5%; $\chi^2 = 158.910$, $p < 0.001$) and to spend more than two hours daily on screens (80.6% vs. 51.4%; $\chi^2 = 86.420$, $p < 0.001$). These obesogenic behaviors are consistent with the higher prevalence of obesity observed in urban settings, underlining the need for targeted, location-specific interventions focused on improving adolescent nutrition, increasing physical activity, and reducing sedentary time.

Table 3: Urban–Rural Comparison of Lifestyle Behaviors Among Adolescents (n = 954)

Behavior/Variable	Urban (n = 670)	Rural (n = 284)	χ^2-value	p-value
Frequent Fast-Food Consumption	406 (60.6%)	66 (23.2%)	129.780	< 0.001
Daily Sugary Beverage Intake	412 (61.5%)	125 (44.0%)	25.860	< 0.001
Low Fruit & Vegetable Intake	453 (67.6%)	165 (58.1%)	6.350	0.012
Physical Activity < 60 minutes/day	497 (74.2%)	81 (28.5%)	158.910	< 0.001
Screen Time > 2 hours/day	540 (80.6%)	146 (51.4%)	86.420	< 0.001

Note: Chi-square test was used to assess associations between location and behaviour.

Adolescents' Perception and Knowledge of Obesity Determinants by Location

Table 4 presents a comparison of adolescents' perception and knowledge of obesity determinants across urban and rural areas. Overall, 82.9% of respondents demonstrated a negative perception, reflecting limited awareness or misconceptions about the causes and prevention of obesity. Urban adolescents had a slightly higher rate of positive perception (18.5%) compared to their rural counterparts (13.7%), and this difference was statistically significant ($\chi^2 = 6.780$, $p < 0.001$), indicating that location may influence perception levels.

In terms of knowledge, only 6.4% of adolescents exhibited good understanding of obesity causes and control, with no significant difference between urban (6.7%) and rural (5.6%) groups ($\chi^2 = 1.190$, $p = 0.275$). This finding points to a widespread knowledge gap among adolescents in both settings, which could limit their ability to adopt preventive health behaviors.

Table 4: Adolescents' Perception and Knowledge of Obesity Determinants by Location (n = 954)

Variable	Urban (n = 670)	Rural (n = 284)	Total (n = 954)	χ^2-value	p-value
Positive Perception	124 (18.5%)	39 (13.7%)	163 (17.1%)	6.780	< 0.001
Negative Perception	546 (81.5%)	245 (86.3%)	791 (82.9%)		
Good Knowledge	45 (6.7%)	16 (5.6%)	61 (6.4%)	1.190	0.275
No/Neutral Knowledge	625 (93.3%)	268 (94.4%)	893 (93.6%)		

Note: Perception scores were calculated from 5 Likert-scale items (score range: 0–10); scores ≥6 were classified as "positive." Knowledge was assessed through structured questions on causes and prevention of obesity.

DISCUSSION

This study assessed the prevalence and determinants of childhood obesity among adolescents aged 10 - 19 years in Delta South Senatorial District, Nigeria. The findings revealed an overall obesity prevalence of 15.3%, with significantly higher rates among urban adolescents (17.3%) compared to rural adolescents (10.2%). Major contributing factors included increased consumption of calorie-dense foods and low levels of physical activity.

Urban–Rural Disparities and Socioeconomic Influence

The stark difference in obesity prevalence between urban and rural adolescents underscores the influence of

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urbanization and socioeconomic disparities. Urban environments are typically associated with higher family income, limited physical activity due to technological conveniences, and increased access to fast foods and sugary drinks. These factors contribute to an obesogenic environment that promotes weight gain among adolescents.[18] In contrast, rural adolescents engage more in physically demanding tasks like farming and walking, which help maintain energy balance and reduce obesity risk.[19]

Socioeconomic indicators such as parental education and household income also influence dietary choices and health outcomes. Urban parents may promote the consumption of Western-style diets rich in fats and sugars due to perceived social status or convenience, whereas rural families often rely on traditional diets composed of tubers, legumes, and vegetables.[20] Furthermore, differences in access to healthcare and nutritional counseling between urban and rural areas may contribute to the disparity in obesity prevalence.[21]

Dietary Patterns and the Local Food Context

The high consumption of fast foods and processed snacks was a prominent factor associated with obesity, particularly among urban adolescents. Commonly consumed items include meat pies, puff-puff, chin-chin, fried yam, sausage rolls, suya, and sugary beverages like Zobo, Fanta, and Coca-Cola.[22] These products are not only affordable and accessible but are aggressively marketed near schools and in urban markets. This dietary pattern mirrors findings from other regions in sub-Saharan Africa experiencing a nutrition transition.[23]

Physical Inactivity and Sedentary Behaviors

Urban adolescents reported higher levels of sedentary behavior, particularly screen time related to video games and social media. This sedentary lifestyle is consistent with findings from other developing nations where physical activity among adolescents is declining due to urbanization.[24] The lack of recreational infrastructure, safety concerns, and academic pressures in urban areas may further limit opportunities for physical exercise, exacerbating the obesity problem.[25]

School-Based Intervention Strategies

School-based interventions offer a practical and sustainable way to prevent childhood obesity, particularly in low- and middle-income countries (LMICs), where schools provide a stable setting to reach large numbers of adolescents. However, the success of these interventions depends on comprehensive, context-specific strategies that include supportive school policies, stakeholder involvement, and environmental changes.

Evidence from sub-Saharan Africa shows that interventions focused only on health education are often ineffective unless paired with improvements in the school food and physical activity environments. For instance, providing nutrition education without addressing the availability of unhealthy foods near schools has had little impact on changing students' behavior.[26]

Integrating structured nutrition education into school curricula can increase students' knowledge and encourage healthier food choices. Still, meaningful behavioral change is more likely when these lessons are reinforced by supportive environments and positive role modeling at home.[27]

Research from Nigerian urban centers highlights the widespread availability of energy-dense, processed foods near schools as a major driver of poor dietary habits. To counter this, policies should restrict the sale and promotion of unhealthy foods within school zones.[28]

Although physical education is officially part of school programs, it is often poorly implemented. Daily structured physical activity—such as supervised sports, aerobics sessions, or active recess—has proven effective in improving health outcomes in African school-based initiatives.[29]

Family practices and community norms play a key role in shaping adolescents' eating and activity habits. Involving parents in school nutrition programs and incorporating traditional, healthy foods can enhance both the impact and cultural relevance of interventions.[30]

Ongoing monitoring is essential for long-term program success. Simple school-based tools can track BMI, dietary habits, and physical activity patterns, helping educators and policymakers identify challenges and make necessary adjustments.[31]

Strengths and Limitations of the Study

This study employed a large, representative sample and a comparative urban–rural design, enabling robust analysis of contextual differences in adolescent obesity. Standardized anthropometric methods and validated

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questionnaires enhanced data reliability. The focus on adolescents in a relatively under-researched region (Delta South, Nigeria) provides valuable localized insights.

As a cross-sectional, school-based study, causality cannot be inferred and out-of-school adolescents were excluded. Self-reported behavioral data may be prone to recall bias, and the absence of multivariate analysis limited the adjustment for confounding variables.

Implications of the Findings of the Study

The findings of this study have important public health, educational, and policy implications. The significantly higher prevalence of obesity among urban adolescents highlights the urgent need for targeted interventions in urban school settings, where unhealthy dietary habits and sedentary lifestyles are more prevalent.

The observed urban–rural disparities underscore the role of environmental and socioeconomic factors in shaping obesity risk. This suggests that a one-size-fits-all approach may be ineffective; instead, context-specific strategies that address local behaviors, resources, and food environments are necessary.

The poor knowledge and perception of obesity determinants among adolescents, particularly in rural areas, call for strengthened health education within school curricula. Comprehensive, age-appropriate programs that promote physical activity, regulate school food environments, and engage parents can support healthier behaviors from early adolescence.

Finally, the study provides evidence to inform regional policy, supporting the development of school-based health promotion frameworks and guiding future obesity prevention efforts in similar low- and middle-income contexts.

CONCLUSION

The study reveals a significant prevalence of childhood obesity in Delta South Senatorial District, Nigeria, particularly in urban areas. This disparity highlights the strong influence of urbanization, unhealthy dietary habits, and physical inactivity on adolescent health. The findings underscore the critical need for targeted, context-specific interventions that promote healthy eating and active lifestyles within both urban and rural communities. Policymakers are urged to implement school-based nutrition education programs and regulate the marketing of unhealthy foods to children to effectively combat the rising obesity trend in the region.

Declarations

Authors' Contribution: JOE: Conceptualization, data collection, critical review and editing of the manuscript, and funding. OCC: Supervision, review and editing of the manuscript. OMO: Supervision, and software/model development. EPRC: Methodology development, review and supervision. PMB: Formal analysis, original draft preparation, and critical review and editing of the manuscript. OTP: Data analysis.

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