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Obesity-related knowledge, practices, and BMI-for-age status among adolescent senior secondary school students in Bwari Area Council, Abuja, Nigeria: a cross-sectional study.

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Abstract

Background

Adolescent nutritional assessment requires age- and sex-specific interpretation because undernutrition and excess adiposity may coexist during growth.

Objective

This study examined obesity-related knowledge, obesity-related practices, and BMI-for-age status among adolescent senior secondary school students in Bwari Area Council, Abuja, Nigeria.

Methods

A school-based cross-sectional study was conducted among students aged 13–19 years. Of 410 records in the raw dataset, seven students older than 19 years and two records with biologically implausible BMI-for-age z-scores were excluded, leaving 401 participants. Knowledge and practice were scored using 10-item scales and categorized with Bloom's cut-offs. BMI was recalculated from measured weight and height and classified using WHO BMI-for-age references. Associations were assessed using chi-square tests and multinomial logistic regression.

Results

Mean age was 15.50 years (SD 1.19). Knowledge was poor in 25.2%, moderate in 51.9%, and good in 22.9% of participants. Practice was poor in 74.1%, moderate in 23.9%, and good in 2.0%. BMI-for-age classification showed thinness in 11.7%, normal status in 79.6%, overweight in 7.2%, and obesity in 1.5%. Knowledge category was not associated with practice category ($p = 0.269$). The overall multinomial model for BMI-for-age status was not statistically significant ($p = 0.257$).

Conclusion

Thinness and excess BMI-for-age coexisted in this school-based adolescent sample. School health promotion in this setting should link nutrition education with feasible dietary, physical activity, and school-environment strategies.

Introduction

Adolescence is an important period for nutrition because rapid growth, pubertal maturation, body composition change, increasing independence, and wider social exposure occur together. Global

evidence shows that underweight, overweight, and obesity among children and adolescents vary across regions and socioeconomic contexts, making adolescent nutrition surveillance especially important in countries undergoing urbanization and food-system transition.[1,2]

Assessment of adolescent weight status requires age and sex specific interpretation. Adult BMI thresholds are not appropriate for adolescents because BMI changes with age, sex, maturation, and growth pattern. The WHO 2007 growth reference provides BMI-for-age interpretation for children and adolescents aged 5–19 years, and WHO AnthroPlus supports the calculation of BMI-for-age z-scores for this age group.[3–5] This distinction is particularly relevant in senior secondary school studies, where late adolescents may be included alongside older students if age eligibility is not carefully defined. In Nigeria, recent evidence suggests a mixed adolescent nutrition profile rather than a single dominant problem. Reviews have reported undernutrition, overweight, obesity, and poor dietary practices across different regions, with variation in study methods, age groups, and anthropometric classification.[6,7] Empirical studies from Nigerian settings also show that food insecurity, dietary diversity, and dietary patterns are observed alongside both undernutrition and excess BMI-for-age among school-aged children and adolescents.[8] At the broader population level, overweight and obesity remain public health concerns in Nigeria, with differences reported by sex and place of residence.[9]

Obesity-related knowledge and practices are important for school health promotion, but knowledge does not necessarily translate into healthier practice. Nigerian and African studies suggest that adolescents may recognize some health consequences of obesity while still having incomplete understanding of prevention, risk factors, and practical behaviour change.[10,11] Studies from Bayelsa, Maiduguri, Kano, and Sokoto have reported gaps in obesity or nutrition knowledge, inconsistent obesity-related practices, and weak or absent relationships between knowledge and practice in some adolescent populations.[12–15] Qualitative evidence from South Africa further suggests that adolescents' explanations of obesity may combine biomedical, social, and lived-experience perspectives, highlighting the need for context-sensitive health education.[16]

The wider African literature also reflects a double-burden pattern, with thinness, normal BMI-for-age, overweight, and obesity reported within school-aged and adolescent populations.[17–21] Obesity-related practices such as sugar-sweetened beverage intake, fast-food consumption, physical inactivity, sedentary behaviour, and limited access to safe activity spaces are shaped by individual, household, school, and neighbourhood conditions.[22–27] School-based interventions may be more relevant when nutrition education is combined with supportive school environments, teacher involvement, parental engagement, and opportunities for physical activity.[28–34]. Bwari Area Council includes urban and peri-urban communities within the Federal Capital Territory, but local evidence on obesity-related knowledge, practices, and measured BMI-for-age status among adolescents is limited. This study examined obesity-related knowledge, obesity-related practices, and WHO BMI-for-age status among adolescent senior secondary school students in Bwari Area Council, Abuja, Nigeria.

Methods

Study design and reporting approach

This was a school-based cross-sectional study among senior secondary school students in Bwari Area Council, Federal Capital Territory, Abuja, Nigeria. Reporting was organized in line with the STROBE recommendations for observational studies.[35] Because exposure and outcome data were measured at the same time, all inferential statements were framed as associations and not as evidence of causation.

Study setting

Bwari Area Council is one of the area councils in the Federal Capital Territory. There are 11 Government Senior Secondary schools in Bwari Area Council (FCT Education Secretariat, 2022) and 15 private secondary schools. The setting is relevant to adolescent nutrition because students may be exposed to different household food environments, school-day eating routines, transport patterns, and opportunities for physical activity. The study focused on registered senior secondary schools in the area council.

Study population and eligibility criteria

The population comprised registered students in selected senior secondary schools. Eligible students were those enrolled in senior secondary school classes, present during data collection, within the WHO BMI-for-age reference age range of 5–19 years, and able to provide assent/consent according to the approved study procedures. Students older than 19 years were excluded from the analytical dataset because WHO BMI-for-age references and WHO AnthroPlus procedures apply to children and adolescents aged 5–19 years.[3–5] Students were also excluded if they had incomplete anthropometric measurements, biologically implausible BMI-for-age z-scores after recalculation, or questionnaire data insufficient for computation of the main scores. Excluding participants above 19 years supported methodological validity by preventing the mixing of adolescent BMI-for-age interpretation with adult BMI classification.

Sample size

The sample size for the study was calculated using the formula below and with a confidence level of 0.05 and an error margin of + 3

$n = Z^2 \times P(1-P)/e^2$

$Z = 1.96$

$P = 0.5$

e = 0.03

$n = 1.96^2 \times 0.5 \times (1-0.5)/0.03^2$

n = 384.16

The accurate sample size for this study is 385 but in case of nonresponsive or unusable questionnaires, 424 questionnaires will be administered (10% of the accurate sample size). Meanwhile 410 responses were used for analysis because some questionnaires were improperly, incompletely filled.

Sampling Technique

The senior secondary schools in Bwari Area Council (BAC) were divided into five zones. These zones were then used to purposively select two mixed schools from each zone based on their geographical locations (purposive sampling). From the selected schools, samples were taken, and questionnaires were distributed to students in senior secondary classes accordingly. A multistage sampling technique was employed to select participants for this study. In the first stage, Bwari Area Council (BAC) was geographically divided into five distinct zones to ensure fair representation across different locations within the council. In the second stage, a simple random sampling method was used to select eligible senior secondary schools from each of the identified zones. The third stage, the sample size of each school was stratified based on the population strength of students in each of the three classes (SS1-SS3). Finally, in the fourth stage, a simple random sampling technique by balloting was adopted within each selected arm to choose the appropriate number of students as shown in the calculations below.

Data collection instrument

Data were collected using an adapted semi-structured, self-administered questionnaire. The instrument contained sections on socio-demographic characteristics, obesity-related knowledge, and obesity-related practices. The knowledge section was adapted from the Obesity Risk Knowledge scale, which was developed to assess knowledge of health risks associated with obesity.[36] Items were reviewed for adolescent comprehension, cultural clarity, and non-stigmatizing wording while preserving the intended construct. The practice section drew on the practice component of a validated obesity knowledge, attitude, and practice questionnaire.[37] Adult-oriented items were removed or modified where they were less applicable to Nigerian senior secondary school students. Response options were simplified to reduce ambiguity and improve consistency during scoring.

Weight and height were measured objectively during data collection using standard field procedures. BMI was recalculated as weight in kilograms divided by height in metres squared. All BMI values were audited against the raw values for weight and height. Adult BMI cut-offs were not used for classification. Instead, BMI-for-age z-scores were generated by applying WHO 2007 age- and sex-specific references for children and adolescents.[3–5] Nutritional status was classified as thinness for BMI-for-age below − 2

SD, normal BMI-for-age from − 2 SD to + 1 SD, overweight above + 1 SD to + 2 SD, and obesity above + 2 SD. Because exact dates of birth and measurement dates were unavailable, age in completed years was used for WHO BMI-for-age referencing, and this limitation is acknowledged in the

Variable scoring.

The obesity-related knowledge scale contained 10 dichotomous items. Correct responses were scored 2 and incorrect responses were scored 0, giving a maximum obtainable score of 20. Negatively worded items were reverse-coded before summation. Total knowledge scores were categorized using Bloom's cut-offs: poor knowledge for scores below 60% (< 12 points), moderate knowledge for 60%-79% (12–15 points), and good knowledge for at least 80% (16–20 points). Higher scores indicated greater obesity-related knowledge.

The obesity-related practice scale also contained 10 dichotomous items. Responses indicating healthy obesity-related practices were scored 2 and responses indicating unhealthy practices were scored 0. The maximum obtainable practice score was 20. Practice was categorized using the same Bloom cut-offs: poor practice for scores below 12 points, moderate practice for 12–15 points, and good practice for 16–20 points. Higher scores indicated healthier obesity-related practices.

Data management and Analysis

The dataset was audited before analysis for sample size, duplicate records, missing values, impossible values, age eligibility, sex coding, anthropometric values, BMI calculation errors, questionnaire coding, and consistency between questionnaire structure and dataset variables. The raw dataset contained 410 records. Participants older than 19 years were removed before final analysis. BMI was recalculated from measured weight and height. Records with biologically implausible BMI-for-age z-scores were excluded from the final complete analytical dataset. Derived variables included BMI, BMI-for-age z-score, BMI-for-age category, knowledge score, knowledge category, practice score, and practice category.

Analyses were conducted using IBM SPSS Statistics version 25. Categorical variables were summarized using frequencies and percentages. Continuous variables were summarized using means, standard deviations, ranges, and 95% confidence intervals where appropriate. Percentages were calculated using the final analytical denominator after exclusion of participants older than 19 years and records with biologically implausible BMI-for-age z-scores.

Chi-square tests of independence were used to examine associations between socio-demographic variables and knowledge category, between knowledge category and practice category, and between socio-demographic variables and practice category. Fisher's exact test or Monte Carlo exact p-values were used where expected-cell assumptions were not met. Cramer's V was reported as an effect-size measure for categorical associations. Because the BMI-for-age category had four nominal categories, multinomial logistic regression was selected rather than binary logistic regression. Normal BMI-for-age

was used as the reference outcome category. Adjusted odds ratios, 95% confidence intervals, and p-values were reported. Statistical significance was assessed at alpha = 0.05.

Ethical considerations

Ethics approval was gotten from the research committee of National Open University of Nigeria with code ETC/2025/04/NOU212070262. Following the Helsinki declaration, consent procedures were conducted according to the approved protocol. The ethical approach was consistent with principles for human-subject research, including respect for participants, voluntary participation, and confidentiality.[38]

Results

Socio-demographic characteristics

The mean age of participants was 15.50 years (SD 1.19; 95% CI 15.39–15.62). Students aged 13–15 years accounted for 213 participants (53.1%), while those aged 16–19 years accounted for 188 participants (46.9%). Females constituted 279 participants (69.6%), and males constituted 122 participants (30.4%). Class distribution showed that SS2 was the largest group, with 187 students (46.6%), followed by SS1 with 153 students (38.2%) and SS3 with 61 students (15.2%) (Table 1).

Table 1
Socio-demographic characteristics of respondents (N = 401)

Variable	Category	n	%
Age group	13–15 years	213	53.1
	16–19 years	188	46.9
Age, years	Mean 15.50 (SD 1.19		
Class	SS1	153	38.2
	SS2	187	46.6
	SS3	61	15.2
Sex	Male	122	30.4
	Female	279	69.6
Religion	Islam	110	27.4
	Christianity	287	71.6
	Traditional	4	1.0
Ethnicity	Hausa/Fulani	41	10.2
	Yoruba	55	13.7
	Igbo	123	30.7
	Other Northern	121	30.2
	Other Southern/Eastern	61	15.2
Maternal education	No formal education	8	2.0
	Primary education	52	13.0
	Secondary education	197	49.1
	Tertiary education	144	35.9
Paternal education	No formal education	6	1.5
	Primary education	40	10.0
	Secondary education	170	42.4
	Tertiary education	185	46.1

Obesity-related knowledge items and categories

The highest correct response was observed for rejecting the statement that obesity increases food allergy risk, with 319 students (79.6%) answering correctly. The next highest correct responses were for

recognizing that a person with obesity can benefit from weight loss (305 students, 76.1%) and identifying that excess abdominal fat is linked to diabetes risk (299 students, 74.6%). Correct responses were also observed for the item on diabetes and unrealistic weight loss requirements (277 students, 69.1%), the high blood pressure item (265 students, 66.1%), and the body-fat distribution item (263 students, 65.6%) (Table 2). Using blooms cutoff, knowledge categorization showed that 101 students (25.2%) had poor knowledge, 208 (51.9%) had moderate knowledge, and 92 (22.9%) had good knowledge

Table 2
Obesity-related knowledge items (N = 401)

Statement	True n	False n	Correct n (%)
Excess abdominal fat is linked to diabetes risk	299	102	299 (74.6)
Obesity increases colorectal cancer risk	223	178	223 (55.6)
A person with obesity and diabetes must lose at least 40% body weight	124	277	277 (69.1)
People with obesity can expect to live as long as people with normal body weight	170	231	231 (57.6)
Obesity increases post-menopausal breast cancer risk	224	177	224 (55.9)
Obesity poses greater health risk for some ethnic groups	185	216	185 (46.1)
There are no health benefits when a person with obesity loses weight	96	305	305 (76.1)
Obesity does not increase high blood pressure risk	136	265	265 (66.1)
Hip/thigh fat is healthier than abdominal/waist fat	263	138	263 (65.6)
Obesity increases food allergy risk	82	319	319 (79.6)

Obesity-related practice items and categories

The highest healthy response was for not avoiding household physical activities, reported by 232 students (57.9%). Healthy responses were observed in 198 students (49.4%) for not usually eating sweet foods or snacks after meals, 183 students (45.6%) for eating regular daily meals, 182 students (45.4%) for consuming fruits and vegetables on most days, and 179 students (44.6%) for not regularly adding extra sugar to drinks (Table 3). Using blooms cutoff, Practice categorization showed that 297 students (74.1%) had poor obesity-related practice, 96 (23.9%) had moderate practice, and 8 (2.0%) had good practice.

Table 3
Obesity-related practice items (N = 401)

Practice statement	Yes n	No n	Healthy response n (%)
Regularly adds extra sugar to drinks	222	179	179 (44.6)
Usually eats sweet foods or snacks after meals	203	198	198 (49.4)
Often avoids household physical activities	169	232	232 (57.9)
Eats more when stressed, worried, or bored	243	158	158 (39.4)
Frequently drinks sugar-sweetened beverages	230	171	171 (42.6)
Eats fried foods several times weekly	230	171	171 (42.6)
Eats regular daily meals	183	218	183 (45.6)
Consumes fruits and vegetables on most days	182	219	182 (45.4)
Exercises at least three times weekly	153	248	153 (38.2)
Spends long hours sitting or using screens outside school	251	150	150 (37.4)

Anthropometric characteristics and BMI-for-age status

Mean weight was 51.79 kg (SD 9.87; 95% CI 50.82–52.76), with a range of 29.5-117.6 kg. Mean height was 1.63 m (SD 0.07; 95% CI 1.63–1.64), with a range of 1.43–1.88 m. Mean BMI was 19.34 kg/m2 (SD 3.22; 95% CI 19.03–19.66), with a range of 13.3–41.7 kg/m2. Mean BMI-for-age z-score was − 0.57 (SD 1.21; 95% CI -0.69 to -0.46), with a range of -4.23 to 3.63 (Table 4). WHO BMI-for-age classification showed that 47 students (11.7%) had thinness, 319 (79.6%) had normal BMI-for-age, 29 (7.2%) were overweight, and 6 (1.5%) had obesity. Thus, most students were classified in the normal BMI-for-age range, but both undernutrition and excess BMI-for-age categories were present in the same school-based sample.

Table 4
Anthropometry, BMI-for-age status, knowledge, and practice summaries (N = 401)

Measure	Estimate	95% CI	Range
Weight, kg	51.79 (SD 9.87)	50.82–52.76	29.5-117.6
Height, m	1.63 (SD 0.07)	1.63–1.64	1.43–1.88
BMI, kg/m2	19.34 (SD 3.22)	19.03–19.66	13.3–41.7
BMI-for-age z-score	-0.57 (SD 1.21)	-0.69 to -0.46	-4.23 to 3.63
BMI-for-age: Thinness	47 (11.7%)		
BMI-for-age: Normal	319 (79.6%)		
BMI-for-age: Overweight	29 (7.2%)		
BMI-for-age: Obesity	6 (1.5%)		

BMI-for-age categories used WHO 2007 cut-offs: thinness < -2 SD, normal − 2 SD to + 1 SD, overweight > + 1 SD to + 2 SD, obesity > + 2 SD.

Bivariate analyses

No statistically significant association was observed between selected socio-demographic variables and knowledge category. Religion was not associated with the knowledge category (chi-square = 0.006, df = 2, p = 0.997; Cramer's V = 0.004). Ethnicity was not associated with the knowledge category (chi-square = 6.357, df = 8, p = 0.607; Cramer's V = 0.089). Maternal education (chi-square = 4.781, df = 4, p = 0.311; Cramer's V = 0.077) and paternal education (chi-square = 3.494, df = 4, p = 0.479; Cramer's V = 0.066) also showed no statistically significant association with knowledge category (Table 5).

Table 5
Bivariate associations involving socio-demographic characteristics (N = 401)

Outcome	Predictor	chi-square	df	p-value	Cramer's V
Knowledge category	Religion	0.006	2	0.997	0.004
Knowledge category	Ethnicity	6.357	8	0.607	0.089
Knowledge category	Maternal education	4.781	4	0.311	0.077
Knowledge category	Paternal education	3.494	4	0.479	0.066

Fisher's exact or Monte Carlo exact p-values were used where expected-cell assumptions were not met.

The knowledge category was not statistically associated with the practice category. The Monte Carlo exact chi-square test showed chi-square = 5.171, df = 4, p = 0.269, with Cramer's V = 0.080. Among students with poor practice, 23.9% had poor knowledge, 52.5% had moderate knowledge, and 23.6% had

good knowledge. Among students with moderate practice, 31.3% had poor knowledge, 49.0% had moderate knowledge, and 19.8% had good knowledge. Among the small group with good practice, none had poor knowledge, 62.5% had moderate knowledge, and 37.5% had good knowledge.

No socio-demographic variable was statistically associated with obesity-related practice category. Age group (chi-square = 0.512, df = 2, p = 0.790; Cramer's V = 0.036), class (chi-square = 5.530, df = 4, p = 0.236; Cramer's V = 0.083), sex (chi-square = 5.387, df = 2, p = 0.057; Cramer's V = 0.116), religion (chi-square = 0.520, df = 2, p = 0.779; Cramer's V = 0.036), ethnicity (chi-square = 2.844, df = 8, p = 0.952; Cramer's V = 0.060), maternal education (chi-square = 5.682, df = 4, p = 0.221; Cramer's V = 0.084), and paternal education (chi-square = 7.215, df = 4, p = 0.120; Cramer's V = 0.095) all had p-values above 0.05

Multinomial logistic regression

A multinomial logistic regression model was fitted with BMI-for-age category as the outcome and normal BMI-for-age as the reference category. Predictors in the model were age, sex, class, knowledge score, and practice score. The overall likelihood-ratio test was not statistically significant (chi-square = 21.467, df = 18, p = 0.257). Nagelkerke pseudo R2 was 0.070, and classification accuracy was 79.6% (Table 6).

For thinness compared with normal BMI-for-age, male sex was statistically associated with higher odds of thinness relative to female sex (AOR = 2.17; 95% CI 1.15–4.07; p = 0.016). Age (AOR = 0.80; 95% CI 0.60–1.07; p = 0.127), SS1 class relative to SS2 (AOR = 1.22; 95% CI 0.61–2.46; p = 0.578), SS3 class relative to SS2 (AOR = 1.72; 95% CI 0.72–4.15; p = 0.224), knowledge score (AOR per 2 points = 0.94; 95% CI 0.75–1.17; p = 0.587), and practice score (AOR per 2 points = 1.05; 95% CI 0.86–1.28; p = 0.650) were not statistically associated with thinness.

For overweight compared with normal BMI-for-age, none of the predictors were statistically significant. Age had AOR = 0.76 (95% CI 0.54–1.08; p = 0.129). Male sex had AOR = 1.05 (95% CI 0.45–2.43; p = 0.909). Class comparisons, knowledge score, and practice score all had p-values above 0.05. For obesity compared with normal BMI-for-age, practice score was statistically associated with higher odds of obesity (AOR per 2 points = 1.88; 95% CI 1.08–3.29; p = 0.026). Age, sex, class, and knowledge score were not statistically significant in the obesity comparison.

Table 6
Multinomial logistic regression for BMI-for-age status (reference outcome: normal BMI-for-age; N = 401)

Outcome	Predictor	AOR	95% CI	p-value
Thinness vs normal	Age (per year)	0.80	0.60–1.07	0.127
Thinness vs normal	Male (ref: female)	2.17	1.15–4.07	0.016
Thinness vs normal	SS1 (ref: SS2)	1.22	0.61–2.46	0.578
Thinness vs normal	SS3 (ref: SS2)	1.72	0.72–4.15	0.224
Thinness vs normal	Knowledge score (per 2 points)	0.94	0.75–1.17	0.587
Thinness vs normal	Practice score (per 2 points)	1.05	0.86–1.28	0.650
Overweight vs normal	Age (per year)	0.76	0.54–1.08	0.129
Overweight vs normal	Male (ref: female)	1.05	0.45–2.43	0.909
Overweight vs normal	SS1 (ref: SS2)	0.82	0.34–1.99	0.662
Overweight vs normal	SS3 (ref: SS2)	1.53	0.54–4.28	0.423
Overweight vs normal	Knowledge score (per 2 points)	1.06	0.80–1.40	0.680
Overweight vs normal	Practice score (per 2 points)	1.23	0.96–1.58	0.099
Obesity vs normal	Age (per year)	1.01	0.51–1.99	0.975
Obesity vs normal	Male (ref: female)	1.02	0.18–5.94	0.982
Obesity vs normal	SS1 (ref: SS2)	0.72	0.11–4.65	0.730
Obesity vs normal	SS3 (ref: SS2)	1.03	0.10-10.51	0.980
Obesity vs normal	Knowledge score (per 2 points)	1.02	0.57–1.83	0.949
Obesity vs normal	Practice score (per 2 points)	1.88	1.08–3.29	0.026

Overall likelihood-ratio chi-square = 21.467; df = 18; p = 0.257; Nagelkerke pseudo R2 = 0.070; classification accuracy = 79.6%. AOR, adjusted odds ratio; CI, confidence interval; SS, senior secondary.

Discussion

This study provides a school-based profile of obesity-related knowledge, practices, and WHO BMI-for-age status among adolescent senior secondary school students in Bwari Area Council. The knowledge findings suggest partial understanding rather than comprehensive obesity literacy. Students more often recognized selected issues such as abdominal adiposity, diabetes risk, and benefits of weight loss, but they were less likely to answer correctly on cancer-related risks and variation in obesity-related health risk across groups. This pattern is compatible with Nigerian evidence showing fair or incomplete

knowledge of obesity or nutrition among adolescents.[11–15] It also aligns with qualitative African evidence indicating that adolescents may understand obesity through a mixture of biomedical, social, and experiential explanations.[16]

The absence of statistically significant socio-demographic differences in knowledge may indicate that knowledge gaps were widely distributed in the sampled schools. This does not mean that household, cultural, or school context is unimportant; rather, within this analytical sample, the measured categories did not distinguish knowledge levels statistically. For health promotion, the practical implication is that school-wide education may be relevant, but it should avoid assuming that knowledge deficits are confined to one religious, ethnic, or parental-education subgroup. Messages should also be specific enough to address misconceptions on less familiar obesity-related health risks, while using non-stigmatizing language suitable for adolescents.

The practice profile was less favourable than the knowledge profile. Most students were classified as having poor obesity-related practices, and healthy responses were particularly low for physical activity, limiting sedentary screen time, stress-related eating, fried foods, and sugar-sweetened beverages. This agrees with Nigerian reviews that describe frequent soft-drink consumption, fast-food intake, low fruit and vegetable intake, and meal skipping among adolescents.[6,7] The findings also sit within broader evidence linking adolescent behaviour patterns to food environments, sugar-sweetened beverages, fast-food exposure, sedentary time, and structured versus unstructured daily routines.[22–27]

The lack of statistical association between knowledge category and practice category is important for interpretation. It suggests that knowing some obesity-related facts was not enough to differentiate healthier practice categories in this sample. This is consistent with adolescent nutrition literature in which knowledge may be necessary but insufficient when adolescents have limited control over foods available at home or school, limited money for healthier foods, peer norms around snacks and sweet drinks, heavy academic schedules, or inadequate safe spaces for activity. In northern Nigerian qualitative evidence, food choice was shaped not only by knowledge but also by affordability, household food environment, gender norms, and adolescent agency.[10] This supports a shift from information-only interventions toward approaches that also modify feasible choices and social support.

BMI-for-age findings showed a double burden of malnutrition. Normal BMI-for-age predominated, but thinness, overweight, and obesity were all present. This pattern agrees with Nigerian systematic reviews and Nigerian school-age evidence indicating that adolescent nutrition problems are heterogeneous across regions, methods, and school populations.[6–8] The prevalence of overweight and obesity in this sample was lower than some African school-based studies, including reports from The Gambia and Burkina Faso, where overweight/obesity varied by sex, diet, and school context.[19,20] At the same time, the presence of thinness is consistent with wider African evidence that undernutrition remains relevant among adolescents even as overweight and obesity emerge.[17,18,21]

The overall multinomial logistic regression model was not statistically significant, indicating that the selected predictors did not collectively improve classification of BMI-for-age category compared with the intercept-only model. Within the model, male sex was associated with higher odds of thinness relative to normal BMI-for-age, and practice score was associated with higher odds of obesity relative to normal BMI-for-age. These predictor-specific findings may identify patterns worth further study, but they can not be interpreted as causal or definitive because the study design was cross-sectional, obesity cases were few, and practice was self-reported. The practice-score finding may also reflect reverse behaviour change, reporting differences, or residual confounding rather than a direct behavioural pathway.

The findings have implications for health promotion in schools. Current evidence on school based programmes suggests that education is more promising when integrated with teacher preparation, parent or caregiver involvement, food-environment improvements, and physical activity opportunities.[28–34] For Bwari Area Council, this could mean strengthening nutrition education while also addressing school snacks, sugar-sweetened beverages, active breaks, household engagement, and adolescent-friendly messaging. Because thinness and excess BMI-for-age coexisted, a double-duty approach is preferable: programmes should promote dietary quality, regular meals, activity, and healthy body image without stigmatizing body size or encouraging unhealthy weight-control behaviours.

The coexistence of moderate knowledge, poor practice, and mostly normal but heterogeneous BMI-for-age status shows why adolescent nutrition studies should avoid relying on one indicator alone. Knowledge scores describe cognitive understanding, practice scores describe reported behaviour, and BMI-for-age describes current anthropometric status relative to age and sex. These domains may overlap, but they are not interchangeable. Future Nigerian school studies should measure them together, include exact date of birth and measurement date, and, where possible, collect information on school food availability, household food security, transport to school, and opportunities for organized physical activity.

Declarations

Conflict of Interest

The authors declare that they have no competing interests with regards to authorship and/or publication of this article.

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Authors' Contribution

PAA conceptualized the study, coordinated data collection, and prepared the initial manuscript draft. JSO was responsible for data curation, statistical analysis, interpretation of statistical findings, and methodological review. YA contributed to study supervision, methodology, and critical revision of the manuscript. OSE contributed to study supervision, project administration, and manuscript review. ANGO contributed to critical review, intellectual revision, and refinement of the manuscript. JOB contributed to methodological review, interpretation of findings, and critical revision of the manuscript. All authors reviewed and approved the final manuscript and agreed to be accountable for all aspects of the work.

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Data Availability

The dataset is available from the corresponding author on reasonable request, subject to applicable confidentiality requirements.

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