Research

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# Anthropometric indices, nutrition knowledge and perceived dietary behaviours of adolescents attending private and public secondary schools in Odeda, Ogun State, Nigeria, based on the Health Belief Model

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## Background
Adolescence is a critical stage for establishing lifelong dietary habits. In Nigeria, socio-economic differences between public and private school adolescents may influence nutrition knowledge, anthropometric status, and dietary behaviour. The Health Belief Model (HBM) provides a useful framework to understand this behaviour and guide interventions aimed at improving it.

## Objective
This study examined the relationship between anthropometric indices, nutrition knowledge, and perception of dietary behaviours among in-school adolescents, and compared outcomes between public and private schools within the HBM framework. The null hypotheses tested were that no significant differences exist in anthropometric indices, nutrition knowledge, or dietary behaviours across school types, and that these factors do not predict anthropometric outcomes.

## Methods
A descriptive cross-sectional study was conducted among a probability sample of 402 adolescents aged 13–17 years from 2 public and 2 private schools in the Odega Local Government Area. Data were collected through validated questionnaires assessing socio-demographics, nutrition knowledge, and HBM constructs, alongside anthropometric measurements following WHO and CDC protocols. Data analysis employed Chi-square, Mann-Whitney U, Spearman's correlation, and multiple regression, with significance set at $p < 0.05$.

## Results
Most of these adolescents had normal BMI-for-age (77.9%) and height-for-age (94.5%). Nutrition knowledge was moderate, at 73.6%. Significant differences by school type were observed in anthropometric indices, nutrition knowledge, and HBM constructs. Regression revealed that nutrition knowledge was associated with BMI-for-age, while perceived benefits, barriers, and self-efficacy were associated with height-for-age.

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**Conclusions**
Private school students demonstrated better anthropometric status and knowledge, while public school students exhibited stronger self-efficacy and cues to action. These findings highlight the influence of school setting and the importance of behaviour-focused, school-based nutrition education for improving adolescent health.

## INTRODUCTION

Adolescence is a critical developmental stage marked by rapid physiological, cognitive, and emotional changes that strongly influence health Behaviours, particularly dietary choices and nutrition-related practices (Keshani et al. 2019; Wariri et al. 2020). Adequate nutrition during this period is vital for growth, cognitive performance, and long-term health. Poor dietary habits formed in adolescence often persist into adulthood, raising risks of obesity, cardiovascular diseases, and diabetes (WHO, 2023).

In Nigeria, adolescents enrolled in schools experience different nutrition-related exposures shaped by socio-economic and educational contexts (Abubakar et al. 2024). Public and private school students often face contrasting realities. Private school adolescents generally benefit from greater access to nutrient-rich foods and structured health education, while public school adolescents may encounter economic and environmental barriers to adequate nutrition (Lewis and Lee, 2020; Olagunju et al. 2025).

Private school students are more likely to display healthier growth patterns, while public school students are at higher risk of stunting and thinness due to limited access to quality diets and resources (Lewis and Lee, 2020; Abubakar et al. 2024; Olagunju et al. 2025). These disparities underline the need for comparative research to understand how school settings influence adolescent nutrition.

Nutrition knowledge is also central to adolescent dietary Behaviour. Studies show that higher nutrition awareness improves dietary diversity, meal planning, and adherence to guidelines (Turconi et al. 2003; Ogunsile and Ogundele, 2016; Bahathig et al. 2023). Yet, gaps persist, particularly in low-resource schools, where household income, parental education, and inconsistent curriculum delivery contribute to unequal knowledge levels (Gunther et al. 2019; Pandey et al. 2018). Understanding these disparities is key to strengthening school and community nutrition education.

The Health Belief Model (HBM) provides a framework to explore such differences. The model explains health behaviour through six constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived cues to action, and perceived self-efficacy (Alyafei and Easton-Carr, 2024). Applied to nutrition, it suggests that adolescents' dietary practices depend not only on knowledge but also on their beliefs about personal risk, the seriousness of poor nutrition, the benefits of healthy eating, and their confidence in overcoming social or economic barriers (Baba et al. 2024). Given the influence of peers, media, and socio-economic disparities, understanding how these perceptions shape food choices is crucial for designing effective interventions (Wang and Togher, 2024).

Despite growing global interest in adolescent nutrition, limited Nigerian studies have integrated anthropometric indices, nutrition knowledge, and perceived dietary behaviours within a theoretical framework. Moreover, very few have compared adolescents from public and private schools, despite clear socio-economic contrasts. This study addresses this gap by examining the relationship between anthropometric indices, nutrition knowledge, and perceived dietary Behaviours among adolescents in Odeda Local Government Area, Ogun State.

## METHODS

### AREA OF THE STUDY

This study was conducted in Odeda Local Government Area (LGA), Ogun State, Nigeria, a semi-urban region situated along the Abeokuta–Ibadan Road, approximately 10 kilometres from Abeokuta, the state capital.

### STUDY DESIGN, POPULATION, SAMPLING PROCEDURE, AND SAMPLE SIZE

A descriptive cross-sectional study design was adopted to examine nutrition knowledge, dietary behaviours, and anthropometric indices among in-school adolescents. The study population included adolescents aged 13 to 17 years, representing a critical phase for nutritional development and behaviour formation.

A multistage sampling approach was applied. At the first stage, five communities within the Opeji Zone: Obantoko, Adao, Alabata, Opeji, and Obete. Obantoko were purposively selected. In the second stage, two public and two private schools from these communities were randomly chosen. Stratification by class level (senior secondary) was employed within each school to ensure representation proportional to the size of the three levels at senior secondary schools. This was followed by proportional allocation and simple random sampling to yield 402 respondents.

The sample size was determined using Cochran's formula, with an assumed 50% prevalence of adequate nutrition knowledge in the absence of local data. A 5% margin of error and 95% confidence level were applied, resulting in 384 participants. To account for possible non-responses, a 5% adjustment increased the final sample to 402 adolescents.

### DATA COLLECTION INSTRUMENTS AND PROCEDURES

Data were obtained through a semi-structured questionnaire and standardised anthropometric measurements. The questionnaire collected socio-demographic and economic information and assessed nutrition knowledge using a validated tool originally developed by Turconi et al. (2003) and adapted by Bahathig et al. (2023). It included items on the composition of a healthy diet, consequences of unhealthy eating, and basic nutrition principles. Questions were presented with different options, and correct responses were summed to generate a total score. Scores of nutrition knowledge were expressed as percentages and categorised as poor (0–40%), moderate (50–70%), or good (>70%) in line with Kigaru et al. (2015).

The HBM framework guided the evaluation of perceived dietary behaviours. The questionnaire used to measure HBM variables was adapted from Keshani et al. (2019) and

Saghafi-Asl et al. (2021). Six cognitive constructs were assessed as applied to healthy dietary behaviour. *Perceived severity* was evaluated across five subscales, capturing participants' views of the seriousness of unhealthy eating in relation to emotional and mental health, physical fitness, short-term and long-term health, and social well-being. *Perceived susceptibility* was measured through a self-assessment of the likelihood of experiencing nutrition-related health problems. In contrast, *perceived benefits* reflected participants' beliefs about the advantages of adopting healthy eating practices. *Perceived barriers* considered both practical challenges, such as food availability and cost, and internal factors, including personal preferences and motivation. *Cues to action* examined internal and external triggers, such as family support, peer influence, and exposure to health information, that could encourage healthy dietary practices. Finally, *self-efficacy* assessed participants' confidence in their ability to maintain healthy eating in diverse situations, including when alone, with peers and family, or in public settings such as restaurants and shopping centres. All items were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with specific maximum scores allocated to each construct (severity = 80, susceptibility = 30, barriers = 35, benefits = 45, cues = 25, and self-efficacy = 65). Construct scores were calculated, converted to percentages, and categorised as unfavourable (0–39%), moderate (40–69%), and favourable (70–100%) perceptions toward healthy dietary behaviour, in line with the approach of Heydari et al. (2023).

Anthropometric indices (weight, height, BMI, and MUAC) were assessed using standardised procedures recommended by the CDC (2020). BMI-for-age Z-scores were computed using WHO cut-offs: severe thinness (<−3SD), thinness (−3SD to <−2SD), normal weight (−2SD to +1SD), overweight (>+1SD to +2SD), and obesity (>+2SD) (Schumacher, 2021).

### INSTRUMENT VALIDATION AND RELIABILITY

The questionnaire was subjected to content validity assessment using Lawshe's (1975) method as updated by Sürücü et al. (2020). An expert review was carried out by ten public health and nutrition specialists. Out of 77 initial items, 31 were accepted, 25 revised, and 21 eliminated, yielding 56 items aligned with the HBM framework. Content Validity Index (CVI) ranged from 0.74 to 1.00, while Content Validity Ratio (CVR) ranged from 0.62 to 1.00, confirming robust validity. Reliability analysis showed strong internal consistency. The overall Cronbach's alpha was 0.85, with construct-specific values as follows: perceived severity (0.89), susceptibility (0.75), barriers (0.73), benefits (0.86), cues to action (0.78), and self-efficacy (0.91).

### INCLUSION AND EXCLUSION CRITERIA

Adolescents aged 13–17 years, enrolled in either public or private secondary schools in Odeda LGA, present during data collection, and with both parental consent and adolescent assent were eligible to participate.

Adolescents with chronic illnesses, eating disorders, diabetes, or any medical condition likely to affect perceived dietary behaviours or anthropometric measurements were excluded. Those already enrolled in another nutrition-related intervention were also excluded.

### ETHICAL CONSIDERATIONS

All procedures adhered to ethical standards. The purpose of the study, potential risks, and rights of participants were explained to both adolescents and their parents or guardians. Participation was voluntary, with written informed consent obtained from parents and assent from the adolescents. Ethical approval was secured from the Federal Medical Centre, Abeokuta Health Research Ethics Committee (FMCA/470/HREC/01/2023/56).

### DATA ANALYSIS

All data were analysed using IBM SPSS (version 27) and Microsoft Excel (2016). Descriptive statistics (means, standard deviations, frequencies, and percentages) summarised demographic data, anthropometric indices, nutrition knowledge, and HBM constructs. Inferential analyses were applied to test study hypotheses: Mann–Whitney U tests compared non-normally distributed continuous variables across school types. Chi-square tests examined associations between categorical variables such as nutrition knowledge level and anthropometric classification. Spearman's correlation assessed associations between nutrition knowledge and dietary Behaviours. Multiple linear regression determined predictors of both dietary behaviour and anthropometric outcomes (BMI-for-age and height-for-age), using independent variables such as HBM constructs, nutrition knowledge, and socio-demographic factors. Statistical significance was set at $p < 0.05$.

## RESULTS

### SOCIODEMOGRAPHIC AND ECONOMIC CHARACTERISTICS OF THE RESPONDENTS

Table 1 shows Sociodemographic and economic characteristics of the 402 adolescents who participated in the study, with a nearly equal distribution between public (50.7%) and private schools (49.3%). Females accounted for 52.5% of the sample, and the majority (68.2%) were aged 13–15 years. Most respondents lived with both parents (74.4%), and 62.9% reported that their fathers had at least secondary education, while 57.5% of mothers had attained a similar level. Household income was higher among private school respondents, reflecting socio-economic differences across school types.

### ANTHROPOMETRIC INDICES AND GENERAL NUTRITION KNOWLEDGE

Table 2 shows the anthropometric and knowledge classifications for the sample of in-school adolescents as a whole. There was little stunting or overweight in this sample. The mean General Nutrition Knowledge (GNK) score of 55.74 ± 13.80 suggests an overall moderate level of understanding of nutrition concepts.

**Table 1. Sociodemographic and economic characteristics of the respondents, by school setting**

| Variable | Aggregate (N=402) | | Public School (N=208) | Private School (N=194) | Total (N=402) | p-value |
|---|---|---|---|---|---|---|
| **Age** | N | % | N (%) | N (%) | N (%) | 0.000* |
| 13 | 10 | 2.5 | 0 (0.0) | 10 (5.2) | 10 (2.5) | |
| 14 | 82 | 20.4 | 40 (19.2) | 42 (21.6) | 82 (20.4) | |
| 15 | 174 | 43.3 | 72 (34.6) | 102 (52.6) | 174 (43.3) | |
| 16 | 74 | 18.4 | 42 (20.2) | 32 (16.5) | 74 (18.4) | |
| 17 | 62 | 15.4 | 54 (26.0) | 8 (4.1) | 62 (15.4) | |
| **Mean ± SD** | 15.24 ± 1.03 | | | | | |
| **Class** | | | | | | |
| SS1 | 172 | 42.8 | 110 (63.9) | 62 (36.1) | 172 (42.8) | 0.000* |
| SS2 | 126 | 31.3 | 86 (68.3) | 40 (31.7) | 126 (31.3) | |
| SS3 | 104 | 25.9 | 12 (11.5) | 92 (88.5) | 104 (25.9) | |
| **Gender** | | | | | | 0.000* |
| Male | 140 | 34.8 | 48 (23.1) | 92 (47.4) | 140 (34.8) | |
| Female | 262 | 65.2 | 160 (76.9) | 102 (52.6) | 262 (65.2) | |
| **Ethnic Group** | | | | | | 0.052* |
| Yoruba | 380 | 94.5 | 196 (94.2) | 184 (94.8) | 380 (94.5) | |
| Igbo | 18 | 4.5 | 12 (5.8) | 6 (3.1) | 18 (4.5) | |
| Hausa | 4 | 1.0 | 0 (0.0) | 4 (2.1) | 4 (1.0) | |
| **Position in Household** | | | | | | 0.174 |
| Only Born | 6 | 1.5 | 4 (1.9) | 2 (1.0) | 6 (1.5) | |
| First Born | 122 | 30.3 | 56 (26.9) | 66 (34.0) | 122 (30.3) | |
| Middle Born | 178 | 44.3 | 102 (49.0) | 76 (39.2) | 178 (44.3) | |
| Last Born | 96 | 23.9 | 46 (22.1) | 50 (25.8) | 96 (23.9) | |
| **Father's Education** | | | | | | 0.000* |
| No Formal Education | 14 | 3.5 | 10 (4.8) | 4 (2.1) | 14 (3.5) | |
| Primary Education | 14 | 3.5 | 12 (5.8) | 2 (1.0) | 14 (3.5) | |
| Secondary Education | 150 | 37.3 | 122 (58.7) | 28 (14.4) | 150 (37.3) | |
| Tertiary Education | 224 | 55.7 | 64 (30.8) | 160 (82.5) | 224 (55.7) | |
| **Mother's Education** | | | | | | 0.000* |
| No Formal Education | 12 | 3.0 | 10 (4.8) | 2 (1.0) | 12 (3.0) | |
| Primary Education | 30 | 7.5 | 24 (11.5) | 6 (3.1) | 30 (7.5) | |
| Secondary Education | 136 | 33.8 | 118 (56.7) | 18 (9.3) | 136 (33.8) | |
| Tertiary Education | 224 | 55.7 | 56 (26.9) | 168 (86.6) | 224 (55.7) | |
| **Father's Occupation** | | | | | | 0.000* |
| Civil Servant | 152 | 37.8 | 56 (26.9) | 96 (49.5) | 152 (37.8) | |
| Professionals | 75 | 18.7 | 30 (14.4) | 45 (23.2) | 75 (18.7) | |
| Technicians | 39 | 9.7 | 34 (16.3) | 5 (2.6) | 39 (9.7) | |
| Trades, Crafts, Farming | 130 | 32.3 | 84 (40.4) | 46 (23.7) | 130 (32.3) | |
| Unemployed | 6 | 1.5 | 4 (1.9) | 2 (1.0) | 6 (1.5) | |
| **Mother's Occupation** | | | | | | 0.000* |
| Civil Servant | 116 | 28.9 | 30 (14.4) | 86 (44.3) | 116 (28.9) | |
| Professionals | 44 | 10.9 | 10 (4.8) | 34 (17.5) | 44 (11.0) | |
| Technicians | 2 | 0.5 | 0 (0.0) | 2 (1.0) | 2 (0.5) | |
| Trades, Crafts, Farming | 234 | 58.2 | 166 (79.8) | 68 (35.1) | 234 (58.2) | |
| Unemployed | 6 | 1.5 | 2 (1.0) | 4 (2.1) | 6 (1.5) | |
| **Household Monthly Income** | | | | | | 0.000* |
| <20,000 | 48 | 11.9 | 44 (21.2) | 4 (2.1) | 48 (11.9) | |
| 20,000 - 50,000 | 58 | 14.4 | 48 (23.1) | 10 (5.2) | 58 (14.4) | |
| 50,001 - 100,000 | 62 | 15.4 | 42 (20.2) | 20 (10.3) | 62 (15.4) | |
| >100,000 | 234 | 58.2 | 74 (35.6) | 160 (82.5) | 234 (58.2) | |
| **Household Size** | | | | | | 0.088 |
| 0-4 | 100 | 24.9 | 60 (28.8) | 40 (20.6) | 100 (24.9) | |
| 5-8 | 286 | 71.1 | 138 (66.3) | 148 (76.3) | 286 (71.1) | |
| 9-12 | 16 | 4.0 | 10 (4.8) | 6 (3.1) | 16 (4.0) | |
| **Number of Siblings** | | | | | | 0.037* |
| 0-4 | 352 | 87.6 | 174 (83.7) | 178 (91.8) | 352 (87.6) | |
| 5-8 | 46 | 11.4 | 32 (15.4) | 14 (7.2) | 46 (11.4) | |
| 9-12 | 4 | 1.0 | 2 (1.0) | 2 (1.0) | 4 (1.0) | |
| **Who Do You Live With?** | | | | | | 0.000* |
| Both Parents | 294 | 73.1 | 132 (63.5) | 162 (83.5) | 294 (73.1) | |
| Mother Only | 52 | 12.9 | 34 (16.3) | 18 (9.3) | 52 (12.9) | |
| Father Only | 6 | 1.5 | 6 (2.9) | 0 (0.0) | 6 (1.5) | |
| Guardian | 26 | 6.5 | 20 (9.6) | 6 (3.1) | 26 (6.5) | |
| Other Relatives | 24 | 6.0 | 16 (7.7) | 8 (4.1) | 24 (6.0) | |

N-Frequency, %-Percentage. Asterisk (*) signifies a statistically significant difference.

**Table 2. Anthropometric and knowledge classifications for the entire sample of in-school adolescents**

| Variable | Frequency (N=402) | Percentage | Mean + SD |
|---|---|---|---|
| **Height for Age Z score Classification** | | | |
| Normal | 380 | 94.5 | **-0.37 ± 1.11** |
| Moderate Stunting | 16 | 4.0 | |
| Severe Stunting | 6 | 1.5 | |
| **BMI for Age Z-score Classification** | | | |
| Severe Thinness | 16 | 4.0 | **-0.8670 ± 1.17** |
| Moderate Thinness | 58 | 14.4 | |
| Normal | 313 | 77.9 | |
| Overweight | 11 | 2.7 | |
| Obesity | 4 | 1.0 | |
| **Classification of General Nutrition Knowledge** | | | |
| Poor Nutrition Knowledge | 44 | 10.9 | **55.74 ± 13.80** |
| Moderate Nutrition Knowledge | 296 | 73.6 | |
| Good Nutrition Knowledge | 62 | 15.4 | |

SD: Standard deviation

PERCEPTIONS OF HEALTHY DIETARY BEHAVIOURS FOR ALL RESPONDENTS

The results from Table 3 indicate that participants generally held positive perceptions across the constructs of the HBM. Perceived benefits had the strongest response, while cues to action also showed favourable responses, indicating that adolescents recognise health messages and professional advice as potential triggers for healthy dietary practices. Finally, self-efficacy was encouraging, with most participants expressing confidence in their ability to adopt healthy diets. Overall, the findings reveal strong recognition of the importance of healthy dietary behaviours, but lower perceptions of personal risk. Persistent barriers may hinder consistent adoption.

**Table 3. Perceptions of healthy dietary behaviours for the entire sample of in-school adolescents**

| Variable | Frequency (N=402) | Percentage | Mean + SD |
|---|---|---|---|
| **PSE** | | | **59.47 ± 9.820** |
| Unfavourable (0-39) | 4 | 1.0 | |
| Moderate (40-69) | 106 | 26.4 | |
| Favourable (70-100) | 292 | 72.6 | |
| **PSU** | | | **17.68 ± 5.365** |
| Unfavourable (0-39) | 50 | 12.4 | |
| Moderate (40-69) | 218 | 54.2 | |
| Favourable (70-100) | 134 | 33.3 | |
| **PBA** | | | **19.97 ± 5.103** |
| Unfavourable (0-39) | 36 | 9.0 | |
| Moderate (40-69) | 286 | 71.1 | |
| Favourable (70-100) | 80 | 19.9 | |
| **PBE** | | | **37.41 ± 5.202** |
| Unfavourable (0-39) | 2 | 0.5 | |
| Moderate (40-69) | 36 | 9.0 | |
| Favourable (70-100) | 364 | 90.5 | |
| **CTA** | | | **19.89 ± 3.454** |
| Unfavourable (0-39) | 6 | 1.5 | |
| Moderate (40-69) | 66 | 16.4 | |
| Favourable (70-100) | 330 | 82.1 | |
| **SEF** | | | **49.06 ± 7.977** |
| Unfavourable (0-39) | 4 | 1.0 | |
| Moderate (40-69) | 94 | 23.4 | |
| Favourable (70-100) | 296 | 73.6 | |

SD-Standard Deviation, PSE-Perceived Severity, PSU- Perceived Susceptibility, PBA- Perceived Barriers, PBE- Perceived Benefits, CTA- Cue to Action, SEF-Self Efficacy

COMPARISON OF ANTHROPOMETRIC INDICES, NUTRITION KNOWLEDGE, AND PERCEPTIONS OF HEALTHY DIETARY BEHAVIOURS BY SCHOOL SETTINGS

Table 4 presents the comparison of anthropometric indices, nutrition knowledge, and perceptions of dietary behaviours between public and private school students, revealing significant disparities. Private school students exhibited lower rates of stunting and thinness but a higher prevalence of overweight and obesity. In contrast, public school students were more affected by stunting and thinness, yet demonstrated more favourable perceptions toward healthy eating.

**Table 4. Comparison of anthropometric indices, nutrition knowledge, and perceptions of healthy dietary behaviours by school settings**

| Variable | School settings | | Chi-Square | p-value |
|---|---|---|---|---|
| | Public School (N=208) | Private School (N=194) | | |
| **HAZ Classification** | | | | |
| Normal | 188 (90.4%) | 192 (99.0%) | 14.572 | 0.001* |
| Moderate Stunting | 14 (6.7%) | 2 (1.0%) | | |
| Severe Stunting | 6 (2.9%) | 0 (0.0%) | | |
| **BAZ Classification** | | | | |
| Severe Thinness | 14 (6.7%) | 2 (1.0%) | 18.215 | 0.001* |
| Moderate Thinness | 36 (17.3%) | 22 (11.3%) | | |
| Normal | 155 (74.5%) | 158 (81.4%) | | |
| Overweight | 3 (1.4%) | 8 (4.1%) | | |
| Obesity | 0 (0.0%) | 4 (2.1%) | | |
| **PSE** | | | | |
| Unfavourable (0-39) | 2 (1.0%) | 2 (1.0%) | 1.363 | 0.506 |
| Moderate (40-69) | 60 (28.8%) | 46 (23.7%) | | |
| Favourable (70-100) | 146 (70.2%) | 146 (75.3%) | | |
| **PSU** | | | | |
| Unfavourable (0-39) | 4 (1.9%) | 46 (23.7%) | 44.401 | 0.000* |
| Moderate (40-69) | 130 (62.5%) | 88 (45.4%) | | |
| Favourable (70-100) | 74 (35.6%) | 60 (30.9%) | | |
| **PBA** | | | | |
| Unfavourable (0-39) | 14 (6.7%) | 22 (11.3%) | 38.284 | 0.000* |
| Moderate (40-69) | 128 (61.5%) | 158 (81.4%) | | |
| Favourable (70-100) | 66 (31.7%) | 14 (7.2%) | | |
| **PBE** | | | | |
| Unfavourable (0-39) | 0 (0.0%) | 2 (1.0%) | 2.218 | 0.330 |
| Moderate (40-69) | 18 (8.7%) | 18 (9.3%) | | |
| Favourable (70-100) | 190 (91.3%) | 174 (89.7%) | | |
| **CTA** | | | | |
| Unfavourable (0-39) | 0 (0.0%) | 6 (3.1%) | 22.194 | 0.000* |
| Moderate (40-69) | 20 (9.6%) | 46 (23.7%) | | |
| Favourable (70-100) | 188 (90.4%) | 142 (73.2%) | | |
| **SEF** | | | | |
| Unfavourable (0-39) | 0 (0.0%) | 4 (2.1%) | 20.513 | 0.000* |
| Moderate (40-69) | 34 (16.3%) | 60 (30.9%) | | |
| Favourable (70-100) | 172 (82.7%) | 124 (63.9%) | | |
| **GNK Classification** | | | | |
| Poor Nutrition Knowledge | 24 (11.5%) | 20 (10.3%) | 30.988 | 0.000* |
| Moderate Nutrition Knowledge | 172 (82.7%) | 124 (63.9%) | | |
| Good Nutrition Knowledge | 12 (5.8%) | 50 (25.8%) | | |

SD-Standard Deviation, PSE-Perceived Severity, PSU- Perceived Susceptibility, PBA- Perceived Barriers, PBE- Perceived Benefits, CTA- Cue to Action, SEF-Self Efficacy, GNK-General Nutrition Knowledge

CORRELATION BETWEEN NUTRITION KNOWLEDGE AND PERCEPTIONS OF HEALTHY DIETARY BEHAVIOURS

Table 5: The analysis of correlations between nutrition knowledge and dietary Behaviours reveals that higher nutrition knowledge (GNK) is strongly linked to positive dietary attitudes and practices. GNK shows a significant positive association with perceived benefits (PBE), indicating that greater knowledge enhances recognition of healthy eating advantages. It is also positively correlated, though more weakly, with perceived severity (PSE) and cues to action (CTA), reflecting stronger awareness of risks and greater motivation to act.

Conversely, GNK is negatively correlated with perceived barriers (PBA) ($r = -.305$, $p < 0.01$) and perceived susceptibility (PSU), suggesting that knowledgeable individuals perceive fewer obstacles and lower vulnerability to diet-related risks. Further, perceived benefits are strongly associated with cues to action, self-efficacy, and perceived severity, reinforcing their central role in shaping healthy eating behaviours.

COMPARISON BETWEEN THE ANTHROPOMETRIC INDICES, NUTRITION KNOWLEDGE, AND PERCEPTIONS OF HEALTHY DIETARY BEHAVIOURS IN THE ENTIRE SAMPLE

Table 6 result reveals significant differences in adolescents' growth, nutrition knowledge, and dietary Behaviours across school settings. Height-for-age (HAZ) differed significantly ($p = 0.000$), with a mean of -0.3691 ± 1.1065, highlighting disparities in growth status. Similarly, BMI-for-age (BAZ) showed a significant difference ($p = 0.000$), with a mean of -0.8670 ± 1.1714, reflecting variations in nutritional status.

General nutrition knowledge (GNK) was also significantly different ($p = 0.000$), with a mean score of 55.74 ± 13.799, indicating unequal awareness of good nutrition across school types. Among dietary Behaviours, significant differences were observed in perceived severity (PSE) (mean = 59.47 ± 9.820, $p = 0.022$), perceived susceptibility (PSU) (mean = 17.68 ± 5.365, $p = 0.000$), perceived barriers (PBA) (mean =

19.97 ± 5.103, p = 0.000), perceived benefits (PBE) (mean = 37.41 ± 5.202, p = 0.001), and self-efficacy (SEF) (mean = 49.06 ± 7.977, p = 0.000). However, cues to action (CTA) showed no significant difference (mean = 19.89 ± 3.454, p = 0.362), suggesting similar motivation across school settings.

**Table 5. Association between nutrition knowledge and perceptions of healthy dietary behaviours (Spearman's Correlation), entire sample**

| | Correlation Coefficient | | | | | | |
|---|---|---|---|---|---|---|---|
| **Variable** | **GNK Score** | **PSE** | **PSU** | **PBA** | **PBE** | **CTA** | **SEF** |
| **GNK Score** | 1.000 | .151** | -.118* | -.305** | .382** | .199** | .050 |
| **PSE** | .151** | 1.000 | .132** | .040 | .551** | .429** | .444** |
| **PSU** | -.118* | .132** | 1.000 | .375** | -.060 | .045 | .091 |
| **PBA** | -.305** | .040 | .375** | 1.000 | -.204** | -.182** | -.090 |
| **PBE** | .382** | .551** | -.060 | -.204** | 1.000 | .662** | .434** |
| **CTA** | .199** | .429** | .045 | -.182** | .662** | 1.000 | .573** |
| **SEF** | .050 | .444** | .091 | -.090 | .434** | .573** | 1.000 |

PSE-Perceived Severity, PSU- Perceived Susceptibility, PBA- Perceived Barriers, PBE- Perceived Benefits, CTA- Cue to Action, SEF-Self Efficacy. Significance level: p < 0.01 (highly significant) is marked with double asterisk (**), p < 0.05 (significant) is marked with single asterisk (*). N = 402 for all correlations.

**Table 6: Comparison between the anthropometric indices, nutrition knowledge and perceptions of healthy dietary behaviours, entire sample**

| Variable | Mean ± SD | Mann-Whitney U | Wilcoxon W | Z-Value | p-value |
|---|---|---|---|---|---|
| **HAZ** | -0.3691 ± 1.1065 | 12,678.000 | 34,414.000 | -6.442 | 0.000** |
| **BAZ** | -0.8670 ± 1.1714 | 15,055.000 | 36,791.000 | -4.399 | 0.000** |
| **GNK** | 55.74 ± 13.799 | 14,514.000 | 36,250.000 | -4.883 | 0.000** |
| **PSE** | 59.47 ± 9.820 | 17,508.000 | 39,244.000 | -2.295 | 0.022* |
| **PSU** | 17.68 ± 5.365 | 16,086.000 | 35,001.000 | -3.525 | 0.000** |
| **PBA** | 19.97 ± 5.103 | 13,250.000 | 32,165.000 | -5.965 | 0.000** |
| **PBE** | 37.41 ± 5.202 | 16,446.000 | 38,182.000 | -3.273 | 0.001** |
| **CTA** | 19.89 ± 3.454 | 19,148.000 | 38,063.000 | -0.911 | 0.362 |
| **SEF** | 49.06 ± 7.977 | 15,866.000 | 34,781.000 | -3.715 | 0.000** |

Test- Mann-Whitney U Test Results.; HAZ-Height for age Z-score, BAZ- BMI for age Z-score, GNK-General Nutrition Knowledge. PSE-Perceived Severity, PSU-Perceived Susceptibility, PBA- Perceived Barriers, PBE- Perceived Benefits, CTA- Cue to Action, SEF-Self Efficacy

MULTIPLE REGRESSION ANALYSIS FOR PREDICTORS OF ANTHROPOMETRIC INDICES FOR THE ENTIRE SAMPLE

Table 7a: The multiple regression model predicting height-for-age Z-score (HAZ) is statistically significant (F = 8.949, p < 0.001), explaining 13.7% of the variance in HAZ ($R^2$ = 0.137), with an adjusted $R^2$ of 0.122. Perceived susceptibility (PSU) (B = -0.027, p = 0.014) and perceived barriers (PBA) (B = -0.031, p = 0.009) show significant negative associations with HAZ, indicating that higher levels of perceived risk and barriers to healthy eating are linked to lower height-for-age scores. Similarly, self-efficacy (SEF) (B = -0.038, p < 0.001) has a significant negative association with HAZ, suggesting that higher confidence in dietary decision-making is paradoxically linked to lower height-for-age scores. In contrast, perceived benefits (PBE) (B = 0.075, p < 0.001) exhibit a significant positive association with HAZ, indicating that greater recognition of the benefits of healthy eating corresponds to higher height-for-age scores. Other predictors, including perceived severity (PSE), cue to action (CTA), and nutrition knowledge score (GNKS), do not significantly influence HAZ (p > 0.05).

Table 7b: The multiple regression model predicting BMI-for-age Z-score (BAZ) is statistically significant (F = 5.460, p < 0.001), explaining 8.8% of the variance in BAZ ($R^2$ = 0.088), with an adjusted $R^2$ of 0.072. The only significant predictor of BAZ is nutrition knowledge score (GNKS) (B = 0.024, p < 0.001), indicating that higher nutrition knowledge is positively associated with BMI-for-age Z-scores.

**Table 7a: Multiple regression analysis for predictors of height-for-age Z-score (HAZ), entire sample**

| Predictor Variables | B (Unstandardized Coeff.) | Std. Error | Beta (Standardised Coeff.) | t-value | Sig. (p-value) |
|---|---|---|---|---|---|
| **(Constant)** | 0.668 | 0.522 | - | 1.280 | 0.201 |
| **PSE** | 0.005 | 0.007 | 0.045 | 0.700 | 0.484 |
| **PSU** | -0.027 | 0.011 | -0.129 | -2.472 | 0.014 |
| **PBA** | -0.031 | 0.012 | -0.142 | -2.623 | 0.009 |
| **PBE** | 0.075 | 0.017 | 0.353 | 4.477 | 0.000 |
| **CTA** | -0.042 | 0.022 | -0.131 | -1.906 | 0.057 |
| **SEF** | -0.038 | 0.009 | -0.272 | -4.433 | 0.000 |
| **GNKS** | -0.007 | 0.004 | -0.082 | -1.558 | 0.120 |

**Model Summary**

| Model R | $R^2$ | Adjusted $R^2$ | Std. Error of Estimate | F-Test | p-value |
|---|---|---|---|---|---|
| 0.370 | 0.137 | 0.122 | 1.037 | 8.949 | 0.000 |

GNKS-General Nutrition Knowledge Score.; PSE-Perceived Severity, PSU- Perceived Susceptibility, PBA- Perceived Barriers, PBE- Perceived Benefits, CTA-Cue to Action, SEF-Self Efficacy

**Table 7b. Multiple regression analysis for predictors of BMI-for-age Z-score (BAZ), entire sample**

| Predictor Variables | B (Unstandardized Coeff.) | Std. Error | Beta (Standardised Coeff.) | t-value | Sig. (p-value) |
|---|---|---|---|---|---|
| **(Constant)** | -0.589 | 0.568 | - | -1.037 | 0.300 |
| **PSE** | -0.005 | 0.008 | -0.042 | -0.641 | 0.522 |
| **PSU** | -0.009 | 0.012 | -0.040 | -0.750 | 0.454 |
| **PBA** | -0.001 | 0.013 | -0.006 | -0.105 | 0.917 |
| **PBE** | -0.006 | 0.018 | -0.027 | -0.336 | 0.737 |
| **CTA** | -0.037 | 0.024 | -0.109 | -1.545 | 0.123 |
| **SEF** | -0.003 | 0.009 | -0.021 | -0.335 | 0.738 |
| **GNKS** | 0.024 | 0.005 | 0.279 | 5.139 | 0.000 |

**Model Summary**

| Model R | $R^2$ | Adjusted $R^2$ | Std. Error of Estimate | F | p-value |
|---|---|---|---|---|---|
| 0.297 | 0.088 | 0.072 | 1.12828 | 5.460 | 0.000 |

GNKS-General Nutrition Knowledge Score.; PSE-Perceived Severity, PSU- Perceived Susceptibility, PBA- Perceived Barriers, PBE- Perceived Benefits, CTA-Cue to Action, SEF-Self Efficacy

# DISCUSSION

This study provides a comparative analysis of anthropometric indices, nutrition knowledge, and perceptions of dietary behaviours of in-school adolescents in private and public schools, guided by the Health Belief Model (HBM). Significant disparities were observed between public and private school adolescents, reflecting broader socio-economic divisions.

Household income patterns confirmed this divide: most private school families earned above ₦100,000 monthly, while public school households earned substantially less. These findings mirror earlier Nigerian studies reporting widespread low parental income (Ilo et al. 2024) but also suggest gradual improvements over time. Household size further highlighted inequality, as smaller family units in private schools may allow greater parental investment per child. Comparable results were noted by Abeer et al. (2023) in Saudi Arabia, where family size and parental education were strongly linked to adolescent nutrition outcomes. Nearly half of respondents were aged 15, with a slightly higher proportion in private schools, consistent with reports of late enrolment and grade repetition among adolescents from low-resource households (Salahshoori et al. 2014; Ilo et al. 2024; Ibeanu et al. 2020).

The study explored adolescents' perceptions towards healthy dietary behaviours within the HBM framework, examining perceived severity, susceptibility, benefits, barriers, cues to action, and self-efficacy. Perceived severity was moderately high, with most adolescents acknowledging the consequences of unhealthy eating. However, nearly one-third (27.4%) demonstrated a moderate to unfavourable perception of healthy behaviour, suggesting limited awareness of the long-term risks of poor nutrition, such as obesity, diabetes, and cardiovascular diseases. This finding echoes Baba et al. (2024), who emphasised that limited understanding of the severity of poor nutrition among adolescents contributes to unhealthy dietary patterns.

Perceived susceptibility was notably weaker, with most adolescents underestimating their vulnerability to diet-related health risks. Approximately two-thirds of participants demonstrated low awareness of the need for engagement in preventive health and dietary behaviours, a pattern consistent with Wickman et al. (2008) and Anokye et al. (2023), who reported that adolescents often perceive themselves as invulnerable due to their youth, despite being at heightened risk for developing long-term health complications.

Barriers to healthy eating (which can include such factors as limited financial resources, cultural norms, peer influence, and pervasive marketing of unhealthy foods) were evident, particularly among public school adolescents. Karimi et al. (2023) and Tsochantaridou et al. (2023) similarly identified these external pressures as significant inhibitors of adolescent dietary change. In contrast, perceived benefits of healthy eating were high, suggesting that awareness of the advantages of good nutrition does not necessarily translate into overcoming barriers or engaging in healthier behaviours. Al-Ani et al. (2024) emphasised that while recognition of benefits can stimulate cues to action, sustained behaviour change requires strategies that simultaneously address barriers.

Self-efficacy varied by school type, with public school adolescents displaying greater confidence in their ability to adopt healthy eating practices. This suggests resilience and adaptability in contexts of scarcity. Scaglioni et al. (2018) and Alyafei and Easton-Carr (2024) highlight that both internal (family structure, household income) and external (school setting, peer norms) factors shape adolescents' confidence in dietary decision-making. These findings underscore the need for interventions that build on adolescents' intrinsic self-efficacy while providing structural support to reduce barriers. Nutrition knowledge significantly differed by school type, with private school students more often demonstrating good nutrition knowledge. Interestingly, disparities in knowledge did not fully align with perceptions of dietary behaviours. Public school adolescents demonstrated stronger perceived susceptibility, greater resilience in overcoming barriers, higher cues to action, and stronger self-efficacy compared to private school students. These finding challenges assumptions that socio-economic privilege directly translates into perceptions favourable to healthy dietary behaviour, as also observed by Gautam et al. (2023) and Karimi et al. (2023). Instead, parental educational attainment and modelling may exert a stronger influence on adolescents' actual behaviours (Scaglioni et al. 2018).

This suggests that while private school students benefit from better access to information and resources, adolescents in public schools may be more motivated to act on the knowledge they possess, possibly due to higher health awareness fostered by lived experiences of food insecurity. Timlin et al. (2020) noted that integrating dietary interventions grounded in behavioural theory, such as the HBM, can amplify these motivations and strengthen perception of dietary behaviour change outcomes across both groups.

Anthropometric analysis revealed distinct disparities between school types. Private school adolescents exhibited lower levels of stunting and thinness, suggesting greater food security. However, overweight and obesity were significantly more prevalent among private school adolescents, with no obesity recorded among public school respondents. This dual burden of malnutrition highlights the influence of socio-economic privilege on dietary risk. Access to both nutritious and energy-dense processed foods among private school adolescents may explain these findings. Uthman-Akinhanmi et al. (2024), Sodipo et al. (2024), and Uthman-Akinhanmi et al. (2025) documented similar patterns where high-income households facilitated access to both healthy foods and unhealthy "CRAP" foods (carbonated, refined, artificial, processed), increasing obesity risk.

Parental feeding practices may also contribute. Hübner and Bartelmeß (2024) observed that higher socio-economic status is sometimes associated with overindulgence, where food is used as a reward, thereby exceeding caloric requirements. Conversely, public school adolescents, though more vulnerable to thinness and stunting, demonstrated dietary behaviours reflective of stronger resilience and discipline. Linde et al. (2022) and Osman et al. (2024) emphasised that parental modelling and moderate restriction, rather than coercion, are more effective in shaping positive dietary habits.

This study revealed a strong association between nutrition knowledge and perceived benefits of healthy eating.

Adolescents with greater nutrition knowledge showed a stronger understanding of the benefits of healthy eating and perceived the risks of unhealthy diets as more serious. They were also more responsive to internal and external cues such as improved energy, emotional well-being, social encouragement, and exposure to nutrition information, which motivated healthier eating behaviours.

These findings are consistent with Kigaru et al. (2015) and Hammouh et al. (2023), who argued that adequate nutrition education enhances both awareness and motivation to adopt healthier lifestyles. However, perceived barriers remained a significant obstacle.

In addition, even with adequate knowledge and motivation, socio-economic challenges limited the ability of some adolescents to translate knowledge into practice. Iyassu et al. (2024) reported similar findings in Ethiopia, where adolescents with strong nutrition knowledge continued to face barriers related to food cost and accessibility. This underscores the importance of coupling knowledge-based interventions with structural supports, such as affordable access to healthy foods.

The present study further highlighted a strong relationship between cues to action and self-efficacy, but weaker associations with perceived barriers. Lubinda (2024) similarly reported that higher nutrition knowledge increases adolescents' confidence in making healthy choices, though perceived barriers remain a persistent challenge.

Regression analysis demonstrated distinct predictors of anthropometric outcomes. Nutrition knowledge emerged as a significant predictor of BMI-for-age, underscoring the influence of information on body composition. Perceived benefits, barriers, and self-efficacy predicted height-for-age, suggesting that these cognitive constructs can influence linear growth indirectly.

The paradoxical negative association between self-efficacy and height-for-age suggests that adolescents with growth challenges may overstate confidence in dietary choices as a coping mechanism, a possibility also suggested by Saghafi et al. (2020). This complexity highlights the need for mixed-method approaches to better capture how adolescents' perceptions align with actual behaviours and health outcomes. The low proportion of variability explained by the models suggests that adolescent nutrition and growth are influenced by a wide range of factors beyond the HBM constructs and nutrition knowledge assessed in this study. Salahshoori et al. (2014) similarly reported weak associations between HBM constructs and BMI, reinforcing the multi-dimensional nature of adolescent nutrition.

### LIMITATIONS OF THE STUDY

This study has some limitations that should be acknowledged. First, the cross-sectional design restricts the ability to draw causal inferences between nutrition knowledge, dietary behaviours, and anthropometric outcomes. Second, reliance on self-reported information for perceived dietary behaviours may have introduced recall or social desirability bias, potentially affecting accuracy. Third, the study was conducted in a single Local Government Area of Ogun State, which limits the generalizability of findings to adolescents in other regions of Nigeria.

## CONCLUSION

This study assessed the relationship between anthropometric indices, nutrition knowledge, and perceived dietary behaviours among adolescents in public and private schools, using the Health Belief Model as a framework. While most adolescents maintained normal growth patterns, overweight and obesity were more common in private schools, whereas thinness and stunting were more prevalent in public schools. Nutrition knowledge was generally moderate, but significantly higher among private school students. Within the HBM framework, perceived benefits and cues to action were strong across both groups, but public-school adolescents demonstrated greater self-efficacy and ability to act despite barriers. Nutrition knowledge was associated with BMI-for-age, while perceived benefits, barriers, and self-efficacy were associated with height-for-age. These results underscore the combined influence of socio-economic context, knowledge, and health beliefs on adolescent nutrition. Practical, behaviour-focused curricular content tailored to the unique needs of both public and private school students should address key psychological and environmental factors influencing dietary habits, improve adolescents' ability to overcome barriers, and boost their confidence in making healthy choices. Enhancing access to nutritious foods through initiatives such as school gardens, healthy school canteens, and well-structured feeding programs, particularly in public schools, will further support healthy eating behaviours. Equally important is restricting the sale and availability of unhealthy, energy-dense foods within school environments, as this will reduce adolescents' exposure to obesogenic choices and complement efforts to promote healthy diets. Finally, strong policy support from the government is vital to ensure that adolescent nutrition is prioritised, with equitable access to resources, nutrition education, and behaviour change interventions across all socio-economic groups.

AUTHOR CONTRIBUTIONS

DDA: Conception/design, development of data collection instrument, interpretation of data, data collection, and interpretation of data, manuscript preparation and revision. YOU: Design, development of data collection instrument, interpretation of data. MOA: Data collection, interpretation of data, manuscript preparation and revision. BTO: Data collection, interpretation of data, manuscript preparation and revision. OAS: Interpretation of data and manuscript preparation and revision. EDO: Interpretation of data and manuscript preparation and revision. OMS: Interpretation of data and manuscript preparation, and revision. All authors approved the final version for publication.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN SCIENTIFIC WRITING

Nothing to disclose

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