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# Diet quality and nutrition knowledge of in-school adolescents in private and public schools at Odeda local government area

## *Calidad de la dieta y conocimiento nutricional de los adolescentes escolarizados en instituciones públicas y privadas del área de gobierno local de Odeda*

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**ABSTRACT**

**Introduction**: Adolescence is a critical developmental stage where nutrition plays a vital role in growth and long-term health. Despite this, many adolescents fail to meet dietary recommendations, resulting in poor diet quality and increased risk of malnutrition and non-communicable diseases.

**Objective**: To examine the associations between diet quality and nutrition knowledge among in-school adolescents in private and public schools in Odeda Local Government Area, Ogun State, Nigeria..

**Methodology**: A descriptive cross-sectional design was employed, involving 402 adolescents aged 13–17 years selected through multi-stage random sampling from two public and two private schools. Dietary intake was assessed using the Global Diet Quality Project tool, while nutrition knowledge was measured with a validated questionnaire. Data were analyzed using descriptive statistics, chi-square tests, and multiple regression at $p < 0.05$ significance level.

**Results**: The mean age of respondents was 15.24 ± 1.03 years, with females comprising 65.2%. While 56.5% of adolescents had adequate dietary diversity, 84.8% fell below

global dietary recommendations. Nutrition knowledge was moderate in 73.6%, good in 15.4%, and poor in 10.9%. Private school students had significantly higher nutrition knowledge ($p = 0.001$), though no significant differences were found in dietary diversity or adherence to dietary recommendations between school types. Multiple regression revealed that household position ($p = 0.001$) and number of siblings ($p = 0.025$) significantly predicted dietary diversity, while gender ($p = 0.014$) and maternal education ($p = 0.020$) predicted adherence to global dietary recommendations.

**Conclusion**: Adolescents in Odeda LGA showed moderate dietary diversity but poor adherence to global dietary recommendations. While private school students demonstrated slightly better nutrition knowledge, overall diet quality was inadequate. These associations, given the cross-sectional design, should be interpreted with caution. Further longitudinal and interventional studies are needed to better understand and address adolescent dietary behaviors.

**Keywords:** Adolescents; Recommended Dietary Allowances; Feeding Behavior; Nutritional Status; Health Knowledge, Attitudes, Practice; Schools; Nigeria.

**RESUMEN**

**Introducción:** La adolescencia constituye una etapa crítica del desarrollo en la que la nutrición desempeña un papel esencial para el crecimiento y la salud a largo plazo. Sin embargo, muchos adolescentes no cumplen con las recomendaciones dietéticas, lo que conduce a una calidad alimentaria deficiente y a un mayor riesgo de malnutrición y enfermedades no transmisibles.

**Objetivo:** Analizar la relación entre la calidad de la dieta y el conocimiento nutricional en adolescentes escolarizados de instituciones públicas y privadas del Área de Gobierno Local de Odeda, Estado de Ogun, Nigeria.

**Metodología:** Se realizó un estudio descriptivo transversal con 402 adolescentes de 13 a 17 años, seleccionados mediante muestreo aleatorio por etapas en dos escuelas públicas y dos privadas. La ingesta alimentaria se evaluó con la herramienta del *Global Diet Quality Project*, y el conocimiento nutricional mediante un cuestionario validado. Los datos se analizaron con estadística descriptiva, pruebas de chi-cuadrado y regresión múltiple, considerando un nivel de significación de $p < 0.05$.

**Resultados:** La edad media fue de 15.24 ± 1.03 años, con predominio femenino (65.2%). El 56.5% presentó diversidad dietética adecuada, aunque el 84.8% no alcanzó las recomendaciones globales. El conocimiento nutricional fue moderado en el 73.6%, bueno en el 15.4% y deficiente en el 10.9%. Los alumnos de escuelas privadas mostraron mayor conocimiento nutricional ($p = 0.001$), sin diferencias significativas en diversidad o adherencia dietética según el tipo de escuela. La posición en el hogar ($p = 0.001$) y el número de hermanos ($p = 0.025$) predijeron la diversidad dietética, mientras que el sexo ($p = 0.014$) y la educación materna ($p = 0.020$) predijeron la adherencia a las recomendaciones.

**Conclusión:** Los adolescentes de Odeda presentaron una diversidad alimentaria moderada y baja adherencia a las recomendaciones globales. A pesar del mayor conocimiento nutricional en escuelas privadas, la calidad dietética general fue insuficiente. Se requieren estudios longitudinales e intervencionales para comprender y mejorar los hábitos alimentarios en esta población.-

**Palabras clave:** Adolescente; Ingesta Diaria Recomendada; Conducta Alimentaria; Estado Nutricional; Conocimientos, Actitudes y Práctica en Salud; Escuelas; Nigeria.

## INTRODUCTION

Adolescence is a vital period marked by significant developmental changes that affect dietary behaviour and nutritional needs [1]. It offers a critical window to instill healthy eating habits and reduce the risk of nutrition-related non-communicable diseases [2]. However, many adolescents do not meet dietary recommendations, resulting in poor diet quality and increased risks of both undernutrition and overnutrition [3]. In Nigeria, adolescent malnutrition is a growing concern, with high rates of micronutrient deficiencies, overweight, obesity, and persistent undernutrition [4].

Diet quality reflects nutritional adequacy and diversity, which are key to adolescent health, and is influenced by socio-economic status, parental education, food environment, and nutrition knowledge [5,6]. A recent study in Odeda Local Government, Ogun State, revealed that while 56.5 % of adolescents achieved adequate dietary diversity, up to 84.8 % failed to meet global dietary recommendations, underscoring a serious nutrition gap [5]. Furthermore, significant disparities exist between adolescents in public and private schools. Private school students are often from households with higher income and parental education, which influences their access to diverse diets and health information, whereas public school students are more likely to face economic and dietary constraints [5,6].

Nutrition knowledge significantly shapes dietary behaviour, yet many adolescents, particularly in public schools, lack adequate understanding [7]. In the Odeda study, 73.6 % of respondents had only moderate knowledge, and just 15.4 % demonstrated good knowledge, with private school students performing significantly better than their public-school counterparts (25.8 % vs. 5.8 %) [5]. This highlights how parental education, household income, and school type can directly impact adolescent nutrition literacy [5-7].

Integrating nutrition education into school curricula is recommended to improve awareness and dietary practices [8]. Schools offer a strategic platform for such interventions, but current efforts often overlook the central role of education in driving sustainable dietary change [1,9]. The Odeda study further identified maternal education and gender as

significant predictors of adherence to dietary recommendations, reinforcing the importance of tailoring interventions to family and socio-demographic contexts [5].

Given the limited research on the impact of school-based nutrition education in Nigeria, this study aims to examine the associations between diet quality and nutrition knowledge among in-school adolescents in private and public schools in Odeda Local Government Area, Ogun State, Nigeria. By comparing the nutritional behaviours and knowledge levels of students across school types, the study provides insights for designing targeted interventions that can effectively bridge gaps in adolescent diet quality and promote long-term health outcomes.

## METHODOLOGY

### *Study Design and Population*

A descriptive cross-sectional study design was employed to examine the associations between diet quality and nutrition knowledge among in-school adolescents in public and private secondary schools within Odeda LGA.

### *Study Area*

This study was conducted in Odeda Local Government Area (LGA), Ogun State, Nigeria, which is located along the Abeokuta-Ibadan Road, approximately 10 kilometers from Abeokuta, the state capital. The region comprises several towns and villages with a strong agricultural presence and a growing commitment to health and education, making it a suitable location for research on adolescent nutrition. The Odeda LGA has both, public and private secondary schools providing a diverse educational setting for the study.

### *Study Criteria*

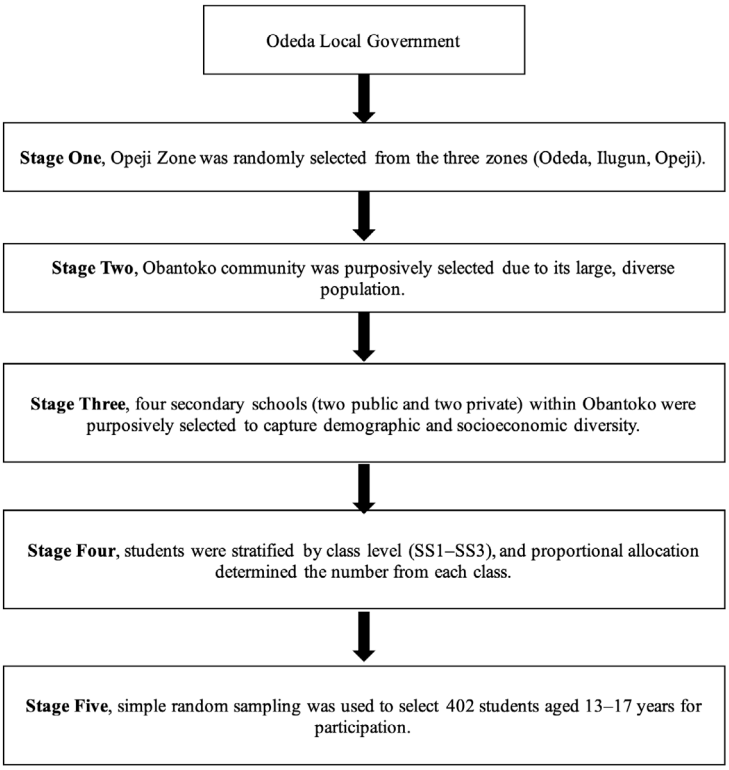
The study included adolescents aged 13 to 17 years enrolled in public or private secondary schools in Odeda LGA. Participants had to be available during the study period, willing to provide informed assent, and have parental or guardian consent. Adolescents with chronic illnesses affecting dietary behaviors or anthropometric measurements were excluded. Additional exclusion criteria included those with diagnosed eating disorders, diabetes, or other chronic conditions, unwillingness to participate, and lack of parental consent.

## *Sampling Techniques*

Odeda Local Government Area (LGA) comprises three administrative zones: Odeda, Ilugun, and Opeji. The Opeji Zone was randomly selected using a simple random sampling technique. Within this zone, five communities exist: Obantoko, Adao, Alabata, Opeji, and Obete. Obantoko was purposively chosen because it has the largest population and a diverse socio-demographic profile, encompassing both urban and peri-urban settings with a mix of public and private secondary schools representing varied socio-economic backgrounds. From the list of registered secondary schools in Obantoko, four (two public and two private) were purposively selected to capture this diversity. Within each school, students were stratified by class level (Senior Secondary 1–3), and proportional allocation determined the number of participants per class. Finally, students were selected through simple random sampling, yielding a total of 402 adolescents aged 13–17 years.

**Figure 1.**

*A flow diagram illustrating the multi-stage sampling process (LGA → Zone → Community → Schools → Students).*



### *Sample Size Determination*

The sample size was determined using Cochran's formula for cross-sectional studies, assuming a 50 % prevalence of adequate nutrition knowledge due to a lack of prior studies in the region. A margin of error of 5 % and a 95 % confidence level were applied, yielding a required sample size of 384 participants. To account for potential non-responses, a 5 % adjustment was made, resulting in a final sample size of approximately 402 students.

### *Data Collection*

A semi-structured questionnaire was utilized to assess the socioeconomic characteristics of the respondents, alongside information on dietary diversity, nutrition knowledge, and related behaviors. The questionnaire was administered through face-to-face interviews conducted by trained research assistants. Data collection took place between July 24 and September 30, 2024, during regular school sessions and not within an examination period, ensuring that participants were relaxed and engaged. The process was carried out within the school environment under the supervision of class teachers to facilitate coordination and minimize disruption to academic activities.

Household size was categorized based on the classification by de Ville *et al.* [10], with small households comprising 1–3 members, medium households consisting of 4–6 members, and large households having 7 or more members. This classification provided a framework for understanding household composition and its implications for resource allocation and socioeconomic dynamics.

Nutrition knowledge was assessed using a validated questionnaire developed by Turconi *et al.* [11] and Bahathig *et al.* [12], modified and adapted for this study. The instrument comprised 20 multiple-choice items covering food groups, nutrient functions, and healthy eating practices. Each correct response was scored one (1**)**, and incorrect or "don't know" responses were scored zero (0). Total scores were converted to percentages and categorized as poor (0–40 %), moderate (50–70 %), or good (>70 %), based on Hammouh *et al.* [13]. The adapted questionnaire demonstrated good internal reliability with a Cronbach's alpha (α) of 0.81.

Dietary intake was evaluated using the Dietary Quality Questionnaire for Nigeria [14]. The Dietary Diversity Score (DDS) was categorized into three levels: low dietary diversity, indicating limited food group intake associated with poor nutritional quality; minimum dietary diversity, reflecting an adequate but basic variety of food groups; and high dietary diversity, signifying a wide range of food group consumption linked to improved nutritional outcomes [15-16]. Participants were categorized based on their Dietary Diversity Scores (DDS) as follows**:** Inadequate Dietary Diversity (0–4), Adequate Dietary Diversity (5–7), and High Dietary Diversity (8–10)**.** In line with the Food and Agriculture Organization

(FAO) classification [16], participants who consumed at least five out of the ten food groups were considered to have *adequate dietary diversity*, whereas those consuming fewer than five food groups were classified as having *inadequate dietary diversity*.

The Global Dietary Recommendation (GDR) classification was applied to assess diet quality using a scoring system. Scores ranging from 0 to 10 were categorized as *below GDR*, indicating non-adherence to recommended dietary standards and underscoring the need for dietary improvement. Scores between 11 and 18 were classified as *meeting GDR*, reflecting adherence to global dietary guidelines and an overall healthy and balanced diet [14–15]. The Global Dietary Recommendation (GDR) score categorization was adapted for use in this study to provide a practical framework for distinguishing between lower and higher GDR score among adolescents. While the cut-off points have not been formally validated in the Nigerian adolescent population, their use was informed by prior applications in similar studies, where they demonstrated a positive correlation with adherence to global dietary guidelines [15].

## *Reliability and Validity Test*

A pre-tested, validated questionnaire adapted from Amoran *et al.* [17] was used to assess participants' socio-demographic and economic characteristics. Reliability was assessed using Cronbach's alpha, with a threshold of >0.70 for acceptability. The questionnaire achieved an overall reliability of 0.85, indicating strong internal consistency. However, while the instrument demonstrated high reliability, exploratory or confirmatory factor analysis to establish construct validity was not conducted. As such, although the tool was suitable for assessing general nutrition knowledge, the absence of formal construct validation in this population limits the extent to which it can be assumed to measure the broader construct of *practical nutritional knowledge* among Nigerian adolescents.

## *Ethical Considerations*

Ethical approval was obtained from the Health Research Ethics Committee of the Federal Medical Centre, Abeokuta (FMCA/470/HREC/01/2023/56). Written informed consent was obtained from parents or guardians, and informed assent was secured from all adolescent participants after a clear explanation of the study's purpose and procedures. Participation was voluntary, and confidentiality was ensured through anonymized data coding and restricted access to study records. The study posed no foreseeable risk to participants and complied with established ethical standards for research involving human subjects.

### *Data Analysis*

Data analysis was performed using IBM SPSS (version 27) and Microsoft Excel (version 2016). Descriptive statistics, including mean and standard deviation, were used to summarize continuous variables such as diet quality scores and nutrition knowledge scores, while categorical variables were presented using frequency distributions and percentages. Chi-square tests were employed to compare diet quality and nutrition knowledge distributions between private and public-school adolescents. Socio-demographic characteristics, including gender, age groups, and socioeconomic status, were analyzed using frequency and percentage distributions, while continuous variables such as household income and parental education were summarized using mean and standard deviation. Additionally, multiple linear regression was performed to identify predictors of diet quality, incorporating nutrition knowledge, school type, and socioeconomic factors as independent variables. Statistical significance was set at $p < 0.05$.

## RESULTS

### *Sociodemographic and economic characteristics of respondents*

Table 1 shows the results of the study revealed notable differences in the sociodemographic and economic characteristics of adolescents attending public and private secondary schools in Odeda LGA. The majority of respondents were 15 years old, with a mean age of 15.24 ± 1.03 years. A significant difference in age distribution existed between school types ($p = 0.001$), with 26.0 % of public-school students aged 17, compared to just 4.1 % in private schools. Gender distribution also differed significantly ($p = 0.001$), with females making up 65.2 % of the overall sample and representing a higher proportion in public schools (76.9 %) than in private schools (52.6 %). Most students identified as Yoruba (94.5 %), with minimal representation from Igbo (4.5 %) and Hausa (1.0 %) ethnic groups.

There was a marked variation in class levels, with SS1 students comprising 42.8 % of respondents, predominantly from public schools (63.9 %), while SS3 students represented 25.9 %, with most (88.5 %) in private schools. A stark contrast in parental education was evident: 82.5 % of private school students' fathers and 86.6 % of their mothers had tertiary education, compared to only 30.8 % and 26.9 %, respectively, in public schools ($p = 0.001$). These trends extended to occupation, where private school parents were more often civil servants or professionals, while public school parents were mainly engaged in trades, crafts, or farming.

Economic disparity was further reflected in household income, with 82.5 % of private school students from households earning over 100 000 Naira monthly, in contrast to just 35.6 % in public schools. Public school students were more likely to belong to larger households and have more siblings ($p = 0.037$). Living arrangements also varied

significantly, with 83.5% of private school students living with both parents, compared to 63.5 % of public-school students (p = 0.001), indicating differences in household structure and possibly stability.

**Table 1.**
*Sociodemographic and economic characteristics of respondents*

| Variable | Aggregate (N=402) | Public School (N=208) | Private School (N=194) | Total (N=402) | p-value |
|---|---|---|---|---|---|
| Age | N (%) | N (%) | N (%) | N (%) | 0.001* |
| 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 %) | 0.001* |
| 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** | | | | | 0.001* |
| 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(-) | 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** | | | | | 0.001* |
| 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 %) | |

| Variable | Aggregate (N=402) | Public School (N=208) | Private School (N=194) | Total (N=402) | p-value |
|---|---|---|---|---|---|
| Tertiary Education | 224 (55.7 %) | 64 (30.8 %) | 160 (82.5 %) | 224 (55.7 %) | |
| **Mother's Education** | | | | | 0.001* |
| 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** | | | | | 0.001* |
| 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** | | | | | 0.001* |
| 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(-) | 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** | | | | | 0.001* |
| < ₦20,000 (≈14USD) | 48 (11.9 %) | 44 (21.2 %) | 4 (2.1 %) | 48 (11.9 %) | |
| ₦20,000 - ₦50,000 (≈14-34USD) | 58 (14.4 %) | 48 (23.1 %) | 10 (5.2 %) | 58 (14.4 %) | |

| Variable | Aggregate (N=402) | Public School (N=208) | Private School (N=194) | Total (N=402) | p-value |
|---|---|---|---|---|---|
| ₦50,001 - ₦100,000 (≈35-69USD) | 62 (15.4 %) | 42 (20.2 %) | 20 (10.3 %) | 62 (15.4 %) | |
| >₦100,000 (≈70USD) | 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?** | | | | | 0.001* |
| 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(-) | 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*

*Statistical significance tested using Chi-square for categorical variables and independent t-test for continuous variables*
*Asterisk (*) signifies statistical significant difference at $p < 0.05$*

## *Diet Quality Indicators and General Nutrition Knowledge*

Table 2a shows the mean Food Group Diversity Score (FGDS) among all participants was 5.14 ± 1.90, ranging from 0 to 9. Males recorded a slightly higher FGDS (5.27 ± 1.64) compared to females (5.07 ± 2.02). Similarly, students in public schools (5.20 ± 1.98) had marginally higher scores than those in private schools (5.08 ± 1.81), suggesting comparable dietary diversity across groups. The overall mean GDR score was 8.18 ± 2.20, with a range of 3–16. Males (8.43 ± 2.21) demonstrated slightly greater adherence to global dietary recommendations than females (8.05 ± 2.19). Likewise, students in public schools (8.36 ± 2.27) showed higher adherence than their private school counterparts (7.99 ± 2.11).

Regarding the NCD-Protect score, which measures consumption of foods protective against non-communicable diseases, the mean value was 2.78 ± 1.58 (range 0–7). Males (2.95 ± 1.44) and public school students (2.93 ± 1.70) scored slightly higher than females (2.68 ± 1.65) and private school students (2.61 ± 1.43), indicating somewhat better intake of health-promoting foods. Conversely, the NCD-Risk score, representing consumption of foods that increase NCD risk, averaged 3.60 ± 2.10 (range 0–9) with minimal variation across gender and school type. This suggests similar exposure to unhealthy dietary behaviors among the groups.

Table 2b shows the dietary quality and nutrition knowledge, the mean DDS was 5.14 ± 1.90, suggesting moderate dietary variety. While 56.5 % of adolescents exhibited adequate dietary diversity, 18.4 % had inadequate diversity, and 25.1 % revealed high diversity. However, the Global Dietary Recommendation (GDR) was low, with a mean of 8.18 ± 2.21; 84.8 % of students fell below global dietary guidelines. Nutrition knowledge scores averaged 55.74 ± 13.80, with 73.6 % of adolescents demonstrating moderate knowledge, 15.4% good, and 10.9% poor understanding. These findings underscore critical gaps in both the quality of adolescent diets and their knowledge of nutrition.

**Table 2a:**
*Diet Quality Indicators*

| | Gender | | | | | | School Setting | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | All | | Male | | Female | | Private School | | Public School | |
| | Mean ± SD | Range (Mi-Ma) | Mean ± SD | Range (Mi-Ma) | Mean ± SD | Range (Mi-Ma) | Mean ± SD | Range (Mi-Ma) | Mean ± SD | Range (Mi-Ma) |
| n | 402 | | 140 | | 262 | | 194 | | 208 | |
| DDS (0-10)a | 5.14 ± 1.90 | 0-9 | 5.27 + 1.64 | 2-9 | 5.07 + 2.02 | 0-9 | 5.08 + 1.81 | 0-8 | 5.20 + 1.98 | 1-9 |
| GDR Score (0-18)b | 8.18 + 2.20 | 3-16 | 8.43 + 2.21 | 4-16 | 8.05 + 2.19 | 3-15 | 7.99 + 2.11 | 3-12 | 8.36 + 2.27 | 4-16 |
| NCD-Protect Score (0-9)c | 2.78 + 1.58 | 0-7 | 2.95 + 1.44 | 0-7 | 2.68 + 1.65 | 0-7 | 2.61 + 1.43 | 0-6 | 2.93 + 1.70 | 0-7 |
| NCD-Risk Score (0-9)d | 3.60 + 2.10 | 0-9 | 3.52 + 2.05 | 0-9 | 3.64 + 2.13 | 0-9 | 3.62 + 2.12 | 0-9 | 3.58 + 2.09 | 0-9 |

*Mi, Minimun; Ma, Maximum; n-Frequency; GDR, global dietary recommendations; NCD, non-communicable disease.*

*[a]:Dietary diversity Score (DDS) includes ten food groups: (1) grains, white roots and tuber, and plantains; (2) pulses (beans, peas and lentils); (3) nuts and seeds; (4) dairy; (5) meat, poultry and fish; (6) eggs; (7) dark green leafy vegetables; (8) other vitamin A-rich fruits and vegetables; (9) other vegetables; (10) other fruits.*

*[b]GDR score = (NCD – Protect – NCD – Risk) + 9; measures adherence to global dietary recommendations protective against non-communicable diseases.*

*[c]NCD – protect score measures adherence to global dietary recommendations on foods to consume: (1) whole grains; (2) pulses; (3) nuts and seeds; (4) vitamin A-rich orange vegetables; (5) dark green leafy vegetables; (6) other vegetables; (7) vitamin A-rich fruits; (8) citrus; (9) other fruits.*

*[d] NCD – risk score measures adherence to global dietary recommendations on foods to limit including: (1) soft drinks; (2) baked/grain-based sweets; (3) other sweets; (4) processed meats; (5) unprocessed meat; (6) deep fried food; (7) fast food and instant noodles; (8) packaged ultra-processed salty snacks.*

**Table 2b.**
*Diet Quality Indicators and General Nutrition Knowledge*

| Variable | Frequency | Percent (%) | Mean ± SD |
|---|---|---|---|
| **Dietary Diversity Score (DDS)** | | | 5.14 ± 1.90 |
| Inadequate Dietary Diversity | 74 | 18.4 | |
| Adequate Dietary Diversity | 227 | 56.5 | |
| High Dietary Diversity | 101 | 25.1 | |
| **Total** | 402 | 100.0 | |
| **Global Dietary Recommendation (GDR)** | | | 8.18 ± 2.21 |
| Below GDR | 341 | 84.8 | |
| Meet GDR | 61 | 15.2 | |
| **Total** | 402 | 100.0 | |
| **General Nutrition Knowledge (GNK)** | | | 55.74 ± 13.80 |
| Poor Nutrition Knowledge | 44 | 10.9 | |
| Moderate Nutrition Knowledge | 296 | 73.6 | |
| Good Nutrition Knowledge | 62 | 15.4 | |
| **Total** | 402 | 100.0 | |

*Asterisk (*) signifies statistical significant difference at p < 0.05*

## *Association between Diet Quality (DDS, GDR) and GNK across school settings*

Table 3 comparative analysis between public and private school students revealed no significant difference in DDS (p = 0.200). Although private school students had slightly better adequate diversity (60.8 % vs. 52.4 %), a higher percentage of public-school students (28.4 %) achieved high diversity than those in private schools (21.7 %). Similarly, both groups had poor adherence to GDR, with 87.6 % of private and 82.2 % of public-school students falling below global dietary standards, a non-significant difference (p = 0.130). However, a significant difference emerged in nutrition knowledge (p = 0.001): private school students were more likely to have good knowledge (25.8 %) compared to only 5.8 % in public schools, while a greater share of public-school students had moderate knowledge (82.7 %) than private school students (63.9 %).

**Table 3.**
*Association between Diet Quality (DDS, GDR) and GNK across school settings*

| | School settings | | | |
|---|---|---|---|---|
| **Variable** | **Public School N(%)** | **Private School N(%)** | **Chi-Square** | **P-Value** |
| **Dietary Diversity (DDS)** | | | | |
| Inadequate DDS | 40 (19.2%) | 34 (17.5%) | 3.221 | 0.200 |
| Adequate DDS | 109 (52.4%) | 118 (60.8%) | | |
| High DDS | 59 (28.4%) | 42 (21.7%) | | |
| **Global Dietary Recommendation (GDR)** | | | | |
| Below GDR | 171 (82.2%) | 170 (87.6%) | 2.289 | 0.130 |
| Meet GDR | 37 (17.8%) | 24 (12.4%) | | |
| **General Nutrition Knowledge (GNK)** | | | | |
| Poor GNK | 24 (11.5%) | 20 (10.3%) | 30.988 | 0.001* |
| Moderate GNK | 172 (82.7%) | 124 (63.9%) | | |
| Good GNK | 12 (5.8%) | 50 (25.8%) | | |

*Asterisk (*) signifies statistical significant difference at p< 0.05*
*Statistical Test: $\chi^2$, t-test, Chi-square*

## *Multiple Regression Analysis Predicting Diet Quality (DDS and GDR)*

Table 4 shows results of multiple regression analysis which revealed that an adolescent's household position significantly predicted dietary diversity (B = 0.584, p = 0.001), with birth order or family role influencing access to diverse foods. Additionally, the number of siblings was also a significant predictor (B = 0.599, p = 0.025), suggesting larger families may offer more dietary variety. However, factors such as school type, age, gender, parental education, and income did not significantly affect DDS. The model was statistically significant (F (12, 389) = 3.252, p = 0.001) but explained only 9.1 % of the variance in DDS ($R^2$ = 0.091), indicating that most of the variation remains unexplained.

Table 5 shows results of GDR, which revealed that gender emerged as a significant predictor (B = -0.621, p = 0.014), indicating gender differences in adherence to dietary guidelines. Maternal education also revealed a significant negative relationship with GDR (B = -0.542, p = 0.020), suggesting that higher maternal education was paradoxically associated with lower dietary guideline adherence. The overall model was statistically significant (F (12, 389) = 1.791, p = 0.048), but it accounted for only 5.2 % of the variance ($R^2$ = 0.052), again suggesting other unmeasured factors likely influence adolescents' dietary adherence.

The results of multicollinearity diagnostic test across both the DDS and GDR regression models, shows that most predictors had VIF values below five, indicating no severe multicollinearity showed that most predictors had VIF values < 5, suggesting an acceptable level of collinearity. However, maternal education, paternal education, household income, and type of school displayed relatively higher VIF values compared to other predictors, indicating moderate intercorrelations among these socioeconomic variables.

**Table 4.**
*Predicting Dietary Diversity Score (DDS)*

| Predictor Variables | B (Unstandardized Coefficients) | Std. Error | β (Standardized Coefficients) | t-value | p-value (Sig.) | Multicollinearity Diagnostics | |
|---|---|---|---|---|---|---|---|
| | | | | | | Tolerance | VIF |
| **Constant** | 6.271 | 1.906 | — | 3.291 | 0.001* | | |
| School Settings | -0.234 | 0.241 | -0.062 | -0.972 | 0.332* | 0.42 | 2.38 |
| How old are you? | -0.180 | 0.099 | -0.097 | -1.815 | 0.070 | 0.89 | 1.12 |
| What is your gender? | -0.263 | 0.212 | -0.066 | -1.242 | 0.215 | 0.94 | 1.06 |
| What is your position in the household? | 0.584 | 0.122 | 0.237 | 4.779 | 0.001* | 0.85 | 1.18 |
| What is the highest level of education completed by your father? | 0.134 | 0.184 | 0.051 | 0.731 | 0.465 | 0.31 | 3.23 |
| What is the highest level of education completed by your mother? | -0.030 | 0.196 | -0.012 | -0.152 | 0.879 | 0.29 | 3.45 |
| What is your father's occupation? | -0.072 | 0.079 | -0.050 | -0.908 | 0.365 | 0.72 | 1.39 |
| What is your mother's occupation? | 0.027 | 0.083 | 0.019 | 0.323 | 0.747 | 0.70 | 1.42 |
| What is your household's monthly income? | -0.103 | 0.101 | -0.059 | -1.018 | 0.309 | 0.28 | 3.60 |
| How many people live in your household? | -0.028 | 0.056 | -0.025 | -0.502 | 0.616 | 0.88 | 1.14 |
| How many siblings do you have? | 0.599 | 0.266 | 0.117 | 2.253 | 0.025* | 0.82 | 1.22 |
| Score | 0.004 | 0.007 | 0.030 | 0.550 | 0.583 | 0.90 | 1.11 |
| **Model Summary** | R=0.302 | $R^2$=0.091 | Adj. $R^2$=0.063 | p = 0.001* | | | |
| **Std. Error** | S.E=1.836 | | | | | | |
| **F-Test** | F (12, 389) = 3.252 | | | | | | |

*Statistical Test: Regression analysis*
*Asterisk (*) signifies statistical significant difference at p< 0.05*
*Note: Tolerance = 1/VIF. VIF values > 5 indicate potential multicollinearity concerns; Variance Inflation Factor (VIF > 10) indicate severe multicollinearity.*

**Table 5.**
*Predicting Global Dietary Recommendation (GDR)*

| Predictor Variables | B (Unstandardized Coefficients) | Std. Error | β (Standardized Coefficients) | t-value | p-value (Sig.) | Multicollinearity Diagnostics | |
|---|---|---|---|---|---|---|---|
| | | | | | | Tolerance | VIF |
| Constant | 14.986 | 2.262 | — | 6.626 | 0.001* | | |
| School Settings | -0.524 | 0.286 | -0.119 | -1.831 | 0.068 | 0.62 | 1.61 |
| How old are you? | -0.226 | 0.117 | -0.105 | -1.927 | 0.055 | 0.88 | 1.13 |
| What is your gender? | -0.621 | 0.251 | -0.134 | -2.475 | 0.014* | 0.91 | 1.10 |
| What is your position in the household? | 0.206 | 0.145 | 0.072 | 1.419 | 0.157 | 0.75 | 1.33 |
| What is the highest level of education completed by your father? | 0.123 | 0.218 | 0.040 | 0.562 | 0.574 | 0.42 | 2.38 |
| What is the highest level of education completed by your mother? | -0.542 | 0.232 | -0.186 | -2.333 | 0.020* | 0.39 | 2.56 |
| What is your father's occupation? | -0.040 | 0.094 | -0.024 | -0.420 | 0.674 | 0.68 | 1.47 |
| What is your mother's occupation? | -0.124 | 0.098 | -0.077 | -1.259 | 0.209 | 0.72 | 1.39 |
| What is your household's monthly income? | 0.063 | 0.120 | 0.031 | 0.523 | 0.601 | 0.36 | 2.77 |
| How many people live in your household? | 0.024 | 0.066 | 0.019 | 0.364 | 0.716 | 0.82 | 1.22 |
| How many siblings do you have? | -0.201 | 0.316 | -0.034 | -0.637 | 0.525 | 0.79 | 1.27 |
| Score | -0.007 | 0.009 | -0.041 | -0.752 | 0.452 | 0.85 | 1.18 |
| **Model Summary** | R = 0.229 | $R^2$ = 0.052 | Adj. $R^2$ = 0.023, | | | | |
| **Std. Error** | S.E= 2.179 | | | | | | |
| **F-Test** | F(12, 389) = 1.791 | p = 0.048* | | | | | |

*Statistical Test: Regression analysis; Asterisk (*) signifies statistical significant difference at p< 0.05*
*Note: Tolerance = 1/VIF. VIF values > 5 indicate potential multicollinearity concerns; VIF > 10 indicate severe multicollinearity.*

## DISCUSSION

This study examined adolescent diet quality and nutrition knowledge in public and private secondary schools in Odeda LGA, Ogun State, Nigeria. It explored how sociodemographic and economic characteristics including age, gender, parental education, and household income influence dietary diversity, adherence to global dietary recommendations, and GNK. The discussion contextualizes these findings within the broader literature to clarify the multifactorial determinants of adolescent nutrition outcomes in Nigeria.

The sociodemographic profile of respondents reflected expected community patterns. Public schools were dominated by older adolescents and females, while private schools had relatively younger and more evenly distributed gender representation, aligning with national trends that attribute these patterns to financial capacity, school entry age, and education policies [18–22]. Parental education and occupation were important markers of socioeconomic advantage, with parents of private school students more likely to hold tertiary education and stable jobs, consistent with prior studies linking socioeconomic status to school choice and quality of education [20–23]. These background variables formed the context in which differences in dietary behavior and nutrition knowledge emerged.

The observed mean DDS indicated a moderate range of food group consumption, consistent with earlier findings among Nigerian adolescents [24]. Private school students generally exhibited higher dietary diversity, likely due to greater household income and food access, while public school students relied more on starchy staples with limited variety [25]. Inadequate dietary diversity is a recognized risk factor for micronutrient deficiencies particularly in iron, vitamin A, and zinc and is often associated with food insecurity and limited nutrition awareness [16, 26]. Conversely, households with higher DDS values likely benefit from greater nutrition awareness and diet quality, leading to improved health and cognitive outcomes [24].

Adolescents' adherence to global dietary standards, measured by the GDR, was generally low, underscoring gaps in diet quality and nutrient adequacy. This finding aligns with earlier reports highlighting Nigerian adolescents' dependence on carbohydrate-rich, nutrient-poor foods [24, 27]. Poor adherence reflects the interplay of socioeconomic disparities, limited parental knowledge, and unhealthy school food environments, where inexpensive, calorie-dense meals dominate [16, 25, 28]. These structural barriers contribute to a dietary pattern that compromises micronutrient intake and long-term health outcomes.

GNK among adolescents was moderate overall, but higher among private school students. Although greater nutrition knowledge can encourage healthier food choices, its influence is often moderated by affordability and food availability [29, 30]. Adolescents from higher-income households may gain more exposure to nutrition education through both school curricula and parental influence [25, 31]. Conversely, the limited emphasis on

nutrition education in public schools constrains students' ability to translate knowledge into practice [31]. This explains the finding that while GNK differed significantly between school types ($p = 0.001$), these differences did not consistently translate into better dietary adherence.

Interestingly, differences in DDS and GDR between public and private school students were not statistically significant ($p = 0.200$ and $p = 0.130$, respectively), implying that school type alone is not a strong determinant of diet quality. Rather, socioeconomic status, food access, and parental education play more substantial roles [16, 32]. Even among public school students, those from households practicing diverse traditional diets achieved high DDS despite limited resources, while private school students with higher GNK also demonstrated better food variety [24, 30]. This reinforces FAO's [16] conclusion that income and household food security are more influential than institutional settings in shaping adolescent dietary behavior.

Low adherence to GDR across both school types reflects broader dietary transitions marked by rising processed food consumption and declining nutrient density [33]. Adolescents' exposure to fast foods and limited access to fruits, vegetables, and whole grains are major contributors [34]. Private school students, despite greater purchasing power, may still prefer calorie-dense convenience foods, while public school students face restricted access to nutrient-rich options [16, 27, 30]. These findings underscore the dual burden of poor diet quality driven by both economic limitation and dietary westernization.

Household factors also emerged as key determinants of dietary diversity. Adolescents with more siblings reported higher DDS, possibly due to shared meals and varied household food preferences a finding supported by de Oliveira [35] and Meller [36]. However, this contrasts with Abebe [37] and Gonete [38], who identified wealth, parental occupation, and food insecurity as stronger predictors. These discrepancies highlight contextual differences in family structure and social dynamics influencing adolescent nutrition.

Regression analyses further revealed that household position and number of siblings significantly predicted dietary diversity, while gender and maternal education predicted GDR. The low explanatory power of these models ($R^2 = 0.091$ for DDS; $R^2 = 0.052$ for GDR) indicates that most of the variability in adolescent diet quality is shaped by unmeasured factors such as cultural preferences, peer influence, and school food environments. The negative association between maternal education and GDR may reflect multicollinearity or complex interactions among socioeconomic factors rather than direct causation.

Gender differences were notable, with females more likely to adhere to dietary recommendations than males, supporting prior findings that females often engage in healthier eating behaviors and portion control [39]. However, gender did not significantly affect dietary diversity, aligning with Dada [40] who found no gender-based differences in dietary diversity or nutrition knowledge among university students.

The counterintuitive negative association between maternal education and dietary adherence aligns with studies showing that higher parental education does not always translate into healthier diets [41]. However, Cribb [42] observed that educated mothers often promote healthier eating patterns, suggesting that the relationship between parental education and adolescent diet is context-dependent, mediated by socioeconomic and cultural factors. Together, these findings imply that beyond parental education, environmental, cultural, and behavioral factors critically shape adolescents' diet quality and nutrition knowledge.

## STUDY LIMITATIONS

This study has several limitations. The Global Dietary Recommendation (GDR) score categorization was adapted without contextual validation, which may introduce construct bias. Although the regression models identified some significant predictors of diet quality, their explanatory power was low ($R^2 < 0.10$), meaning that more than 90% of the variability remains unexplained. The cross-sectional design prevents causal inferences, and reliance on self-reported dietary data introduces potential recall and social desirability bias, while the questionnaire may not fully capture practical nutrition knowledge. Furthermore, the study was limited to a single Local Government Area, and the purposive selection of one community may introduce potential cluster effects and restrict generalizability to other settings. Also, the study did not extensively examine contextual influences such as peer dynamics, cultural food preferences, or the school food environment, which may strongly affect adolescent dietary behaviour.

## CONCLUSION

This study provides valuable insights into the disparities in diet quality and nutrition knowledge among adolescents in different school settings. Although dietary diversity was moderately adequate across both public and private schools, adherence to global dietary recommendations remained poor. The higher nutrition knowledge observed among private school students reflects potential differences in access to nutrition information and school-based learning environments. Gender, maternal education, and household structure were identified as significant associates of adolescent diet quality; however, these variables explained only a small portion of their overall variability. This suggests that other unmeasured factors such as environmental, cultural, and behavioral influences may play important roles. Given the cross-sectional nature of this study and the limited explanatory power of the models, the findings should be interpreted as associative rather than causal. Future research, particularly longitudinal or interventional studies, is needed to better

understand causal pathways and to evaluate the long-term effectiveness of school-based nutrition programs in improving adolescent diet quality and nutrition outcomes in Nigeria.

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### Data Availability Statement

The data supporting the findings of this study are part of an ongoing intervention research and are therefore not publicly available at this time. Data will be made available in a public repository upon completion of the study and following appropriate ethical clearance. Until then, data access is restricted to protect participant confidentiality and ensure the integrity of the ongoing research process. Interested researchers may contact the corresponding author for further information regarding future data access.

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## *Conflict of interest*

The authors have no conflict of interest to declare.

## *Authorship contribution*

**Ademiluyi Dare Damilola**: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Research administration, Resources, Data validation and visualization, Supervision, Manuscript original draft, review and editing.

**Uthman-Akinhanmi Yewande Olajumoke**: Formal analysis, Methodology, Research administration, Resources, Data validation and visualization, Supervision, Manuscript original draft, review and editing.

## APPENDIX A: SUPPLEMENTARY TABLE 1. SUMMARY OF VARIABLE DEFINITIONS, SCORING RUBRIC, AND CUT-OFF POINTS

| Variable | Description / Measurement | Scoring Rubric | Cut-off Points / Classification | Reference(s) |
|---|---|---|---|---|
| Dietary Diversity Score (DDS) | Measures the number of food groups consumed within a 24-hour recall period using the FAO dietary diversity tool. | Each of the 7 food groups consumed was scored 1; total possible score = 7. | <4 = Inadequate dietary diversity; ≥4 = Adequate dietary diversity. | FAO (2016) [16] |
| Global Dietary Recommendation Score (GDR) | Evaluates adherence to global dietary recommendations protective against non-communicable diseases (NCDs). | Calculated as (NCD–Protect – NCD–Risk) + 9. | 0–10 = Below GDR (non-adherence); 11–18 = Meeting GDR (adherence). | FAO (2021); Global Dietary Guidelines [14–15] |
| NCD–Protect Score | Frequency of consumption of foods protective against NCDs (e.g., fruits, vegetables, pulses, nuts, and whole grains). | Each protective food group consumed scored 1; total possible score = 9. | Higher score = greater adherence to protective food recommendations. | FAO (2021) [15] |
| NCD–Risk Score | Frequency of consumption of foods to limit (e.g., fried foods, processed meat, sweets, sugary drinks). | Each risk food group consumed scored 1; total possible score = 9. | Lower score = healthier dietary pattern. | FAO (2021) [15] |
| General Nutrition Knowledge (GNK) | Assesses understanding of food groups, nutrient functions, and healthy eating practices. | 1 = Correct answer; 0 = Incorrect/Don't know. Scores converted to percentages. | 0–40 % = Poor; 50–70 % = Moderate; >70 % = Good. | Turconi et al. (2003) [11]; Bahathig et al. (2019) [12]; Hammouh et al (2021) [13] |