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Research Article

Assessment of dietary diversity score and nutritional status of under-5 children in selected rural areas of Ado-Odo/Ota Local Government Area, Ogun State, Nigeria

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Highlights/Key Messages

- A majority of children sampled had low dietary diversity
- Stunting was significantly associated with low dietary diversity
- Maternal education was positively associated with dietary diversity
- Higher household income was linked to improved child diet quality
- Large household size was associated with reduced dietary diversity scores

Background
Malnutrition remains a significant public health challenge in Nigeria, particularly among children under five in rural communities. Dietary diversity is an important determinant of child nutrition, influencing growth and overall health outcomes.

Objective
This study assessed the dietary diversity score (DDS) and nutritional status of children under five in selected rural areas of Ado-Odo/Ota Local Government Area (LGA), Ogun State, Nigeria.

Methods
A cross-sectional study design was used to collect data from 226 randomly sampled children under five and their caregivers from six randomly selected rural communities in the LGA. Socio-demographic characteristics and dietary intake were assessed using structured questionnaires and a 24-hour dietary recall. Anthropometric measurements were taken to assess nutritional status and compared with the WHO growth standards. Data were analysed in SPSS version 25, and associations between dietary diversity and nutritional indicators were examined using chi-square and regression analyses, with significance set at $p<0.05$.

Results
Findings showed that 69.3% of the children had low dietary diversity, while only 4.6% had high dietary diversity. The most commonly consumed food groups were cereals (92.5%) and vegetables (81.7%), whereas dairy products (21.4%) and eggs (15.9%) were the least consumed. Stunting was observed in 14.2% of children, with 6.8% wasted, and 3.5% underweight. A significant negative association was found between dietary diversity and stunting ($p=0.027$). Socioeconomic factors, including family income ($p=0.008$) and maternal education ($p=0.021$), were significant predictors of dietary diversity.

Conclusion
This study highlights poor dietary diversity and its significant association with child nutrition in a select rural area. The findings underscore the need for targeted interventions to improve access to and consumption of a variety of nutrient-rich foods. Community nutrition education, economic empowerment programmes, and policies that promote local food production should be prioritised to enhance dietary diversity and reduce childhood malnutrition in Nigeria.

Keywords: **Dietary diversity, nutritional status, under-five children, malnutrition, rural Nigeria**

Introduction

Malnutrition among under-five children remains a significant public health concern in Nigeria, contributing to high morbidity and mortality (Amusa et al., 2023). The country has the second-highest global burden of stunting, with a national prevalence of 32% among children under five (John et al., 2024). In 2021, an estimated 2 million children in Nigeria suffered from severe acute malnutrition (SAM), yet only two in ten children affected received treatment (Seer-Uke et al., 2021).

Dietary diversity is a critical indicator of diet quality and nutritional adequacy in children. Studies have shown that diverse, high-quality diets are crucial for the sustainable growth and development of children under five, particularly those in rural farming households (Angula et al., 2024). Inadequate dietary diversity has been linked to various forms of malnutrition, including stunting, wasting, and underweight (Reinhardt & Fanzo, 2014). For instance, a study in the East and West Gojjam Zones of the Amhara Region in Ethiopia found that food diversity and the number of meals consumed per day were significant determinants of stunting and underweight among children under five (Derseh et al., 2023). Additionally, research on preschool children in Northern Ghana identified dietary diversity as a significant factor influencing stunting, wasting, and underweight (Ali et al., 2017).

Similarly, research in Nigeria has highlighted the pervasive triple burden of malnutrition among children, encompassing undernutrition, micronutrient deficiencies, and inadequate complementary feeding practices (John et al., 2024). Studies indicate that a substantial proportion of Nigerian children aged 6–59 months are poorly nourished, with alarming rates of stunting, wasting, and underweight observed across various regions. Specifically, recent reports reveal that approximately 37% of Nigerian children under five years old are stunted, 18% are wasted, and 29% are underweight (John et al., 2024).

These findings underscore the importance of promoting diverse diets to improve children's nutritional outcomes. Several factors influence dietary diversity and nutritional status in children, including socio-economic status, maternal education, household size, and agricultural practices (Darebo et al., 2025). For instance, a study in Lagos State, Nigeria, found that underweight and stunting rates were significantly higher in rural than in urban communities, highlighting the impact of location on nutritional outcomes. Understanding these determinants is essential for developing targeted interventions to improve children's nutritional outcomes (Obasohan et al., 2023).

However, significant gaps remain regarding the contextual issues surrounding dietary diversity and its impact on children's nutritional outcomes in sub-Saharan Africa and Nigeria. For example, studies conducted in Nigeria primarily focused on food security in urban settings or at the state level, without concurrently evaluating dietary diversity scores and anthropometric outcomes at the community level (Senbanjo et al., 2016; Oderinde et al., 2023; Obasohan et al., 2023). Additionally, there is a lack of data on the rural communities of Ado-Odo/Ota LGA in Ogun State, especially given its unique setting, with rapid socio-economic change in an urban-adjacent rural context. This brings into question the association between dietary diversity scores and nutritional outcomes among children under five in the Ado-Odo/Ota LGA. By concurrently evaluating dietary diversity scores, anthropometric outcomes, and socio-demographic predictors among the rural communities of Ado-Odo/Ota LGA in Ogun State, the present study aims to address the knowledge gap regarding nutritional outcomes among children under five years old.

Methods

Study Design

A descriptive cross-sectional study was conducted among children under five and their caregivers from July through August 2024 in the Ado-Odo/Ota LGA of Ogun State, comprising rural and semi-urban communities. The area is known for its agrarian economy, with residents primarily engaged in subsistence farming and petty trading.

Sampling

A sample size of 226 was determined using Cochran's formula for estimating prevalence in an infinite population:

where (Z-score for a 95% confidence interval is 1.96), (5% margin of error) (Senbanjo et al., 2011, 2013), p = 16.4% (Prevalence of underweight among under-five children in Ogun State, Okike, 2021)

$$n = \frac{Z^2 p(1-p)}{d^2}$$

$$n = \frac{1.96^2 0.164(1-0.164)}{0.05^2}$$

n = ~ 211

The sample size was then increased by approximately 7% to account for anticipated attrition and non-response, resulting in a final sample size of 226. No adjustments were made for design effect or finite population size, given the large target population of under-five children in the rural communities.

A multi-stage random sampling method was used, without adjustments for the design effect. First, six rural communities were randomly selected from the list of rural communities in Ado-Odo/Ota LGA. The calculated sample size of 226 was distributed across these communities, as detailed in Table 1. Within each community, all households with at least one eligible under-five child were identified to form a sampling frame, and caregivers were selected using simple random sampling to fulfil the allocated numbers.

This multi-stage approach, incorporating random selection at various levels, aimed to minimise selection bias and enhance the representativeness of the sample within the heterogeneous rural environment (Seer-Uke et al., 2021; Senbanjo et al., 2016).

Table 1. Selected rural communities and sample distribution

Rural Community	Number of Subjects Selected
Ilogbo	38
Alapoti	35
Ketu-Adie Owe	37
Ere	40
Ilobi	38
Igbesa	38
Total	226

Data Collection Methods

A pre-tested, structured, interviewer-administered questionnaire was used to collect socio-demographic data, dietary intake histories, and household characteristics from caregivers (Oderinde et al., 2023). The questionnaire was administered by trained enumerators fluent in local languages (Oderinde et al., 2023) in accordance with standardised protocols to ensure consistency and minimise response bias (Moura et al., 2015).

Dietary Diversity Assessment

A multiple-pass 24-hour dietary recall was conducted with mothers/caregivers to assess the child's intake from the previous day, using visual aids to estimate portion sizes (Hemsworth et al., 2018; Nightingale et al., 2016). Foods were classified into FAO's 12 food group categories (FAO, 2011). The dietary diversity score was computed as the number of unique food groups consumed and categorised as low, medium, or high, consistent with adapted FAO guidelines for child nutrition assessments (FAO, 2011).

Anthropometric Measurements

Anthropometric measurements were conducted in accordance with WHO standard procedures for assessing child growth. Measurements were taken by trained research assistants, obtained in duplicate, and the average values were recorded to improve accuracy. Weighing scales and height boards were calibrated daily using standard weights and rods. Body weight was measured to the nearest 0.1 kg using a SECA digital scale, with children wearing light clothing and no shoes, in line with established protocols (WHO, 2006; Senbanjo et al., 2016). Standing height for children aged ⩾24 months was measured to the nearest 0.1 cm using a portable stadiometer (Anku et al., 2023; Senbanjo et al., 2016); recumbent length for those <24 months was measured using a length board (Senbanjo et al., 2016; Tette et al., 2016). Mid-upper arm circumference was measured at the midpoint of the left arm using a non-stretchable insertion tape to the nearest 0.1 cm (Anku et al., 2023; Ngassa et al., 2022).

Weight-for-age, height-for-age, and weight-for-height Z-scores were computed using WHO Anthro software (WHO, 2009). Data collectors received two days of training, including standardization exercises to achieve inter- and intra-observer reliability >0.90 (WHO, 2008).

Ethical Considerations

Ethical approval was obtained from the Bowen University Teaching Hospital Ethics Committee under approval number BUTH/REC-1168. Written informed consent was obtained from all caregivers after explaining the study procedures, risks, benefits, and the right to voluntary participation in the local language. Verbal assent was obtained from older children, where applicable. Data confidentiality was maintained, and participants could withdraw at any time without prejudice, in accordance with the principles of the Declaration of Helsinki.

Data Analysis

Data were analysed using SPSS version 25. Descriptive statistics (means, frequencies, and percentages) summarised the variables. Chi-square tests were used to assess associations between categorical variables. Linear regression analysis determined predictors of dietary diversity and nutritional status. Statistical significance was set at $p<0.05$.

Results

Socio-Demographic Characteristics of Respondents

Table 2 provides the socio-demographic background of participants in the study.

Table 2. Socio-Demographic characteristics of under-five children and their caregivers in selected rural communities of Ado-Odo/Ota Local Government Area, Ogun State (n = 226)

Variable	Frequency (n)	Percentage (%)
Age group (Months)		
6–11	28	12.4
12–23	54	23.9
24–35	61	27.0
36–47	49	21.7
48–59	34	15.0
Gender		
Male	118	52.2
Female	108	47.8
Caregiver		
Mother	198	87.6
Father	11	4.9
Other relative	17	7.5
Caregiver's age (Years)		
<25	46	20.4
25–34	121	53.5
⩾35	59	26.1
Caregiver's educational status		
No formal education	39	17.3
Primary	71	31.4
Secondary	93	41.2
Tertiary	23	10.2
Caregiver's occupational status		
Unemployed	41	18.1
Trading/artisan	96	42.5
Farming	56	24.8
Civil servant/private sector	33	14.6
Household size		
⩽4	48	21.2
5–7	112	49.6
⩾8	66	29.2
Monthly income (Naira)		
<₦30,000	104	46.0
₦30,000–₦60,000	79	35.0
>₦60,000	43	19.0
Total	**226**	**100.0**

1US$ = ₦1,500 (Naira) at the time when the field work was conducted

Table 3 shows that most children (69.3%) had a low dietary diversity score, consuming fewer than five food groups in the previous 24 hours. Only 4.6% had a high DDS, indicating poor dietary variety in this sample of children, which could contribute to nutritional deficiencies.

Table 4 shows that 14.2% of children were stunted, indicating chronic malnutrition. The prevalence of wasting (6.8%) and underweight (3.5%) was relatively lower.

As shown in Table 5, cereals and vegetables were the most commonly consumed food groups, whereas dairy products and eggs were the least. This pattern reflects a

carbohydrate-heavy diet with limited animal protein, which could contribute to deficiencies in essential micronutrients such as iron and calcium.

Table 3. Dietary diversity score of under-five children in selected rural communities of Ado-Odo/Ota Local Government Area, Ogun State (n = 226)

Dietary Diversity Category	Frequency (n)	Percentage (%)
Low DDS (≤4 food groups)	157	69.3
Medium DDS (5-8 food groups)	59	26.1
High DDS (9-12 food groups)	10	4.6
Mean DDS	5.91 ± 2.15	

Table 4. Nutritional status of under-five children based on anthropometric indices in selected rural communities of Ado-Odo/Ota Local Government Area, Ogun State (n = 226)

Nutritional Indicator	Classification	Frequency (n)	Percentage (%)
Height-for-Age (HAZ)	Stunted (< −2 SD)	32	14.2
Weight-for-Height (WHZ)	Wasted (< −2 SD)	15	6.8
Weight-for-Age (WAZ)	Underweight (< −2 SD)	8	3.5

Table 5. Consumption of food groups among under-five children in selected rural areas of Ado-Odo/Ota Local Government Area, Ogun State (n = 226)

Food Group	Number of Children Who Consumed	Percentage (%)
Cereals	209	92.5
Vegetables	185	81.7
Tubers & Roots	178	78.8
Legumes & Nuts	142	62.8
Fish	130	57.5
Meat	98	43.3
Dairy Products	48	21.4
Eggs	36	15.9

As indicated in Table 6, there was a significant association between DDS and stunting (p=0.027), indicating that children with low DDS were more likely to be stunted. However, DDS was not significantly associated with wasting or underweight status, suggesting that other factors, such as infections or feeding practices, might contribute more to these conditions.

Table 6. Association between dietary diversity score and nutritional status of under-five children in selected rural communities of Ado-Odo/Ota Local Government Area, Ogun State

Nutritional Indicator	DDS Category	Chi-Square (χ^2)	p-value
Stunting (HAZ < -2SD)	Low vs. High	4.92	0.027*
Wasting (WHZ < -2SD)	Low vs. High	2.78	0.095
Underweight (WAZ < -2SD)	Low vs. High	2.49	0.112

DDS = Dietary Diversity Score; χ^2 = Chi-square test; *Statistically significant at p < 0.05; HAZ = Height – for – age; WHZ = Weight – for – height; WAZ = Weight – for – age; SD = Standard Deviation

In Table 7, one can see that family income and maternal education were significant positive predictors of children's dietary diversity scores. Conversely, household size was negatively associated with dietary diversity scores.

Table 7. Multiple linear regression analysis showing socio-demographic predictors of dietary diversity score among under-five children in selected rural communities of Ado-Odo/Ota Local Government Area, Ogun State

Variable	Regression Coefficient (β)	95% CI	p-value
Family Income	0.142	0.037, 0.247	0.008*
Mother's Education	0.127	0.020, 0.234	0.021*
Household Size	-0.109	-0.215, -0.003	0.045*

β = Standardized regression coefficient; CI = Confidence Interval; *Statistically significant at p < 0.05

Discussion

We observed underlying socioeconomic constraints typical of rural Nigerian communities that may influence child feeding practices and nutritional outcomes. The predominance of mothers as primary caregivers underscores the critical role of maternal education and economic capacity in shaping children's dietary quality. Limited educational attainment, engagement in informal occupations, and low household income may restrict access to adequate and diverse foods, while larger household sizes could increase competition for available resources. These findings are consistent with previous studies reporting that socioeconomic disadvantage and low maternal education are key determinants of suboptimal child nutrition in low-resource settings (Deshpande & Ogbuoji, 2024; Imo et al., 2017; Ogunniyi et al., 2024; Olodu et al., 2022; Omachi et al., 2024). Also, these features align with rural Nigerian profiles, where mothers predominate as caregivers in poorer, larger households dominated by informal trading, farming, or unemployment, reflecting economic constraints and limited formal education typical of such settings (Adesuyi et al., 2021; Imo, 2020; Senbanjo et al., 2016).

The majority of children under five in our sample of rural communities of Ado-Odo/Ota Local Government Area had low dietary diversity scores. This aligns with trends in other low-resource rural settings across sub-Saharan Africa and Nigeria, where low DDS predominates due to socioeconomic barriers and heavy reliance on staple foods, though our DDS was slightly better than pooled SSA estimates of inadequate minimum dietary diversity (Ba et al., 2022; Belay et al., 2022; John et al., 2024). In contrast, urban or wealthier areas report higher diversity, highlighting rural-urban disparities driven by limited market access and income constraints, which likely restrict access to a diverse range of nutrient-dense foods (Olodu et al., 2022; Senbanjo et al., 2016).

We found a moderate prevalence of stunting, which compared favourably with national Nigerian averages and some Ogun State reports, and equally low rates of wasting (Obayelu & Oluwakemi, 2020; Ogunnaike et al., 2021; Okike, 2021; Senbanjo et al., 2016). The contrast between higher stunting and lower wasting/underweight likely stems from chronic factors, such as prolonged poor dietary variety that impairs linear growth, versus acute issues, buffered by seasonal food availability or community resilience, though

infections and sanitation gaps may still play roles (Belay et al., 2022).

Cereals were nearly universally consumed, followed closely by vegetables and tubers/roots, whereas legumes/nuts, fish, and meat were consumed by fewer children, with eggs and dairy products least frequently consumed. This carbohydrate-dominant profile mirrors patterns in rural Nigeria and across SSA, where staples predominate because of affordability and local production, contrasting with higher animal-source intake in urban or coastal areas (Angula et al., 2024; Fadare et al., 2018; Have et al., 2020; Olodu et al., 2022; Senbanjo et al., 2016). Probable explanations include economic barriers to animal protein, cultural preferences for plant-based diets, perishability issues in rural settings without refrigeration, and limited integration of livestock. This dietary pattern fosters gaps in iron, calcium, and vitamin A intakes (Hailemariam et al., 2018).

We found a significant association between low DDS and stunting, but not with wasting or underweight. This supports established links in low-income contexts between poor dietary variety and chronic growth faltering via micronutrient shortfalls, consistent with Indian and SSA evidence (Khura et al, 2024). The absence of associations with acute indicators, however, suggests that infections, diarrhoea, or acute illnesses may be overriding influences not captured here (Ba et al., 2022; Belay et al., 2022; Saha et al., 2022; Samuel et al., 2020).

Multiple linear regression identified family income and maternal education as positive predictors of DDS, while household size had a negative effect. These results corroborate studies from SSA, Asia, and rural Nigeria, where greater wealth enables diverse purchases and educated mothers apply better feeding knowledge, whereas in larger families, resources are diluted across members (Ali et al., 2019; Amugsi et al., 2017; Ba et al., 2022; Hailemariam et al., 2018; Mulenga, 2018; Onyeji & Sanusi, 2020). Overall, these findings underscore the socioeconomic drivers of poor dietary diversity and stunting in selected rural areas of Ogun State, despite their proximity to urban hubs. Targeted interventions, including maternal nutrition education, income support, home gardening, and fortified foods, are recommended.

Limitations

Strengths of this study include a representative sample and robust analyses; limitations include a cross-sectional design that limits causality, potential recall bias in the dietary assessment, and the omission of seasonal or WASH data. Longitudinal research incorporating food security could yield deeper insights.

Conclusions

This study reports suboptimal dietary diversity scores and moderate stunting prevalence among children under five years old in urban-adjacent rural areas of the Ado-Odo/Ota LGA, Ogun State, Nigeria, with a predominant consumption of cereals, vegetables, and tubers but limited consumption of animal-source foods. Low DDS was significantly associated with stunting, while family income and maternal education positively predicted DDS, and larger household size negatively influenced it. Targeted interventions, including maternal nutrition education, income generation, home gardening, and fortified foods, are imperative to enhance dietary diversity, curb chronic malnutrition, and promote child growth despite proximity to urban areas.

Author Contributions

J.A.Q.: Conceptualization; Methodology; Supervision; Validation; Critical review and editing; T.I.A.: Conceptualization; Investigation; Data curation; Formal analysis; Writing – original draft preparation; Visualization; I.C.A.: Data collection; Investigation; Writing – review and editing; B.T.E.: Methodology support; Data validation; Writing – review and editing; Y.J.O.: Supervision; Project administration; Writing – review and editing. All authors read and approved the final manuscript.

Declaration of Generative AI and AI-Assisted Technologies in Scientific Writing

The authors declare that artificial intelligence (AI)–assisted tools were used solely to support language refinement, organization, and clarity of presentation during manuscript preparation. All intellectual content, study design, data analysis, interpretation of findings, and final decisions regarding the manuscript remain the sole responsibility of the authors. No AI tool was used for data generation, analysis, or fabrication of results.

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Data Availability Statement

The datasets generated and/or analysed during the current study are not publicly available due to confidentiality agreements with participants, but are available from the corresponding author upon reasonable request for academic and research purposes.

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Conflict of Interest

The authors declare that there are no financial or non-financial competing interests that could have influenced the design, conduct, analysis, or reporting of this study.

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