

Socioeconomic Status, Dietary Diversity, and Household Food Security as Correlates of Nutritional Status among Under-Five Children in Ibadan South- West, Oyo State, Nigeria

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Abstract

Background

Household food insecurity and inadequate dietary diversity remain pervasive threats to child growth in sub-Saharan Africa, yet how these exposures, together with household socioeconomic status (SES), jointly relate to anthropometric outcomes in urban Nigeria is inadequately characterised. To determine the relationship between household SES, child dietary diversity, household food security, and nutritional status among under-five children in Ibadan South-West Local Government Area (LGA), Oyo State, Nigeria.

Methods

A descriptive cross-sectional study was conducted among 215 caregiver–child pairs (children aged 6–59 months), selected through multi-stage random sampling across twelve communities spanning three socioeconomic strata. Food security was assessed with the nine-item HFIAS (Cronbach's alpha = 0.85), dietary diversity with the WHO/UNICEF Minimum Dietary Diversity (MDD) indicator, nutritional status with WHO Child Growth Standards z-scores, and SES with the Ibadin and Akpede scheme. Data were analysed using chi-square tests, Spearman's correlation, and multivariable logistic regression ($p < 0.05$).

Results

Only 19.5% of households were food secure; 52.1% were severely food insecure. Only 32.1% of children met minimum dietary diversity (mean DDS 4.0 ± 1.1 of 7 groups). Stunting (19.1%), wasting (9.8%), and underweight (9.3%) co-existed in the sample. Food insecurity rose sharply with declining SES, from 45.5% (Upper) to 98.4% (Lower) ($\chi^2 = 24.39$, $p < 0.001$), and Lower-class households had markedly higher adjusted odds of food insecurity than Upper-class households (aOR = 88.40, 95% CI: 8.47–923.02). Dietary diversity was uniformly low across SES strata ($p = 0.832$), and neither dietary diversity nor food security was significantly associated with any anthropometric outcome (all $p > 0.14$).

Conclusions

Household socioeconomic status, rather than dietary diversity, was the dominant correlate of food insecurity, while a substantial dietary-diversity deficit existed uniformly across strata, independent of short-term anthropometric status. Nutrition programming in comparable urban Nigerian LGAs should combine SES-targeted food-security interventions with universal dietary-diversification strategies for under-five children.

Background

Household food insecurity remains one of the most persistent threats to child health and survival in sub-Saharan Africa, undermining progress toward the Sustainable Development Goal 2 target of ending hunger and all forms of malnutrition by 2030 [1]. Food security exists only when all members of a household have physical, social, and economic access, at all times, to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Children under five years bear a disproportionate share of the burden when this access is compromised, because their rapid growth, small gastric capacity, and complete dependence on caregivers for feeding make them acutely vulnerable to even short episodes of household food deprivation [2, 3].

Nigeria carries one of the heaviest burdens of child undernutrition globally, with stunting prevalence among children under five persisting above one-third of the population in successive national surveys, alongside substantial underweight and wasting [4]. This national picture, however, conceals marked sub-national heterogeneity. Recent household-level surveys within Ibadan alone have reported food insecurity prevalence ranging from roughly 63% in peri-urban, non-slum communities to over 98% in slum settlements, underscoring that local economic and residential context, rather than national averages, more directly determines a given child's day-to-day food access [5, 6]. A comparable pattern has been documented in south-eastern Nigeria, where more than four in five sampled households reported some degree of food insecurity, driven largely by maternal education, age, income, and work status rather than household composition alone [7].

Dietary diversity the number of distinct food groups consumed over a defined reference period is a widely used proxy for the nutritional adequacy of a child's diet, capturing both energy sufficiency and micronutrient variety in a way that single-nutrient assessments cannot [8, 2]. The WHO/UNICEF Minimum Dietary Diversity (MDD) indicator, which classifies a child as meeting adequate diversity when foods from at least five of eight defined groups are consumed within the preceding 24 hours, is the standard metric for population-level surveillance of complementary feeding quality [3]. Across sub-Saharan Africa, adherence remains low and inconsistently associated with anthropometric outcomes: a 32-country analysis found children with adequate dietary diversity had modestly lower odds of stunting, wasting, and underweight [9], while a South African national survey found dietary diversity significantly associated with stunting and wasting only among certain diversity strata [10]. This inconsistency suggests the diet–anthropometry relationship is context-dependent and may be attenuated in cross-sectional, single-recall designs, where nutritional status reflects a longer causal chain of illness, birth outcomes, and cumulative feeding history rather than the most recent day's intake alone.

Household socioeconomic status (SES) is theorised to sit upstream of both food security and dietary diversity, since it determines purchasing power, market access, and capacity to withstand economic shocks [11]. Yet the strength of the SES–food security relationship varies across Nigerian settings: some studies report a strong SES gradient in food insecurity, while others find weaker or non-linear associations once other household characteristics are accounted for [12]. Whether SES exerts a similarly consistent influence on dietary diversity remains less well characterised, particularly within a single urban Nigerian LGA where SES strata coexist in close proximity. Understanding how SES, food security,

and dietary diversity jointly relate to anthropometric status is essential for targeting nutrition interventions correctly: programmes assuming that improved food access automatically improves dietary diversity, or that dietary diversification alone resolves anthropometric deficits, may be misdirected if these relationships do not hold empirically [13, 14].

This study therefore determined the relationship between household socioeconomic status, child dietary diversity, household food security, and the nutritional status of under-five children (6–59 months) resident in communities of Ibadan South-West Local Government Area, Oyo State, Nigeria. Specifically, the study assessed the level of household food (in)security, quantified child dietary diversity against the WHO/UNICEF minimum threshold, determined the nutritional status of the children using WHO Child Growth Standards, and examined the bivariate and multivariable associations between SES, dietary diversity, food security, and anthropometric status within a single sample spanning the upper, middle, and lower socioeconomic strata of the LGA.

Methods

This section describes the study area and population, design, eligibility criteria, sampling technique, sample size determination, data collection procedures, instrument reliability, scoring criteria, data analysis, and ethical approval underpinning this study.

Study Area and Population

Ibadan South-West Local Government Area (LGA) is one of eleven LGAs constituting the Ibadan metropolis, Oyo State, southwestern Nigeria, with its headquarters at Oluyole Estate. Ibadan is the third most populous city in Nigeria after Lagos and Kano and has been identified among the fastest-growing cities on the African continent. Ibadan South-West LGA spans an area of approximately 40 km² and comprises heterogeneous residential districts including Ring-Road, Oke-Ado, Oke-Bola, Bode, Foko, Elewura, and Alalubosa Estate that collectively span low-, middle-, and high-income neighbourhoods, making the LGA well suited to examining socioeconomic gradients in child nutrition outcomes within a single urban local government context.

The study population comprised children aged 6–59 months and their mothers or primary caregivers, resident in the selected communities within Ibadan South-West LGA at the time of data collection.

Study Design

This study adopted a descriptive, quantitative, cross-sectional design, in which exposure (household SES, food security status, and dietary diversity) and outcome (child nutritional status) were assessed concurrently in a single contact with each household, without follow-up.

Study Criteria

Inclusion criteria: households with at least one child aged 6–59 months who had resided in the study community for a minimum of six months preceding the survey; presence of the child's biological mother or a primary caregiver competent to respond on the child's feeding and household circumstances; and provision of informed consent to participate. Where a household had more than one eligible under-five child, the index (youngest eligible) child was selected for anthropometric and dietary assessment.

Exclusion criteria: children with visible congenital or physical deformities precluding standard anthropometric measurement; acutely ill or hospitalised children at the time of the visit; caregivers unable to communicate in English or Yoruba; and households that declined consent or were unavailable after repeat visits.

Sampling Technique

A multi-stage sampling procedure was used. In the first stage, Ibadan South-West LGA was purposively selected from within the Ibadan metropolis because it uniquely accommodates all three broad socioeconomic classes low, middle, and high within a single administrative boundary, a feature essential to this study's comparative objective. In the second stage, communities within the LGA were stratified into three socioeconomic-class strata, and four communities were randomly selected from each stratum by balloting, yielding twelve communities in total: Foko, Odo-Ona, Bode, and Apena-Gege (low class); Bolumole, Elewura, BCJ, and Ada-Ibeji (middle class); and Alalubosa Estate, Adeoyo, Idi-Ishin, and Kuola (high class). In the third stage, a clustered sampling approach was used to identify households with an eligible under-five child within each selected community, with data collectors moving systematically through each cluster until the community-level quota was achieved.

Sample Size Determination

The minimum sample size was determined using the Leslie–Fisher (Cochran) formula for a single population proportion:

$$n = Z^2pq / d^2$$

where Z is the standard normal deviate at 95% confidence (1.96), p is the anticipated prevalence of household food insecurity among comparable populations (11.4%), q = 1 – p (0.89), and d is the desired precision (0.05). This yielded a minimum sample of approximately 150 households. A 10% allowance for non-response was added (15 households), giving a minimum required sample of 165. A total of 215 caregiver–child pairs were ultimately enrolled and retained complete data across the anthropometric, dietary, and food-security measures, exceeding the minimum requirement and improving the precision of the subgroup (SES-stratified) estimates reported in this manuscript.

Data Collection

Data were collected using an interviewer-administered, semi-structured questionnaire, adapted from validated instruments previously used to assess socioeconomic status, dietary diversity, and household food security among Nigerian populations, supplemented by direct anthropometric measurement of each index child. Prior to data collection, a letter of introduction was presented to the head of each selected community to explain the purpose of the study and obtain community-level approval. At the household level, the purpose, procedures, and voluntary nature of participation were explained to the household head and to the mother or caregiver of the index child, and verbal informed consent was obtained before questionnaire administration.

Weight (kg) was measured using a calibrated digital scale, zeroed before each use. Children able to stand unsupported were weighed directly; for children under 24 months unable to stand independently, the mother was weighed alone and then while holding the child (with the child's outer clothing and any heavy items removed), and the child's weight was derived by subtraction, recorded to the nearest 0.1 kg.

Length/height (cm) was measured using an infantometer for children under 24 months, in a recumbent position on a flat surface from the crown of the head to the heel, and using a stadiometer for children aged 24–59 months, standing without footwear, with heels together, arms at the sides, and the head in the Frankfurt horizontal plane.

Mid-upper arm circumference (MUAC, cm) was measured at the midpoint between the shoulder tip (acromion) and the elbow tip (olecranon) of the left arm using a flexible, non-stretch measuring tape, with the child in a lying, sitting, or standing position as appropriate for age.

Reliability and Internal Consistency

Because the HFIAS is a multi-item scale intended to yield a single composite food-security construct, its internal consistency was formally assessed prior to substantive analysis, rather than assumed from prior validation studies. Cronbach's alpha was computed on the nine-item scale using the analytic sample ($N = 215$) and the raw four-point frequency-of-occurrence coding (1 = never to 4 = often) for each item. The nine-item HFIAS demonstrated good internal consistency, with an overall Cronbach's alpha of 0.85, comfortably exceeding the conventional acceptability threshold of 0.70 [15]. Item-rest correlations ranged from 0.22 ("went a whole day and night without eating") to 0.72 ("ate food not wanted because of lack of resources"), and removal of any single item would not have raised the overall alpha above 0.86, confirming that all nine items contributed coherently to the underlying food-insecurity construct and that none warranted exclusion. This reliability estimate supports the validity of using the summed HFIAS score, and its derived four-category and binary classifications, for the descriptive and inferential analyses reported below.

Scoring Criteria

Household food security was scored using the standard Household Food Insecurity Access Scale (HFIAS) algorithm [16]. Caregivers indicated, for each of nine occurrence items covering the preceding 30 days, whether the described food-access experience had occurred and, if so, how frequently (rarely, sometimes, or often). Following the standard coding algorithm, households were classified into one of four mutually exclusive categories food secure, mildly food insecure, moderately food insecure, or severely food insecure determined jointly by the pattern of affirmative responses across the nine items and their reported frequency of occurrence, with households endorsing the most severe items (such as going a whole day and night without eating) at any frequency classified as severely food insecure. For bivariate and multivariable association analysis, this four-level classification was additionally collapsed into a binary indicator (food secure versus any level of food insecurity), consistent with standard practice when category-specific cell sizes are small.

Child dietary diversity was derived from a multi-pass 24-hour dietary recall administered to the mother or caregiver, covering eight defined food groups: grains/roots/tubers, legumes/nuts, dairy products, flesh foods (meat, fish, poultry), eggs, vitamin-A-rich fruits and vegetables, other fruits and vegetables, and breastmilk. A child-level Dietary Diversity Score (DDS), ranging from 0 to 7, was computed as the count of non-breastmilk food groups consumed in the previous 24 hours, consistent with WHO/UNICEF/USAID-FANTA convention, which excludes breastmilk from the numeric score while retaining breastfeeding status as a separate indicator. Consistent with the WHO/UNICEF Minimum Dietary Diversity (MDD) indicator, a child was classified as having met minimum dietary diversity if foods from at least five of the eight defined groups (inclusive of breastmilk where applicable) were consumed in the previous 24 hours, and as not having met minimum dietary diversity if fewer than five groups were consumed.

Household socioeconomic status (SES) was scored using the revised Ibadin and Akpede [17] socioeconomic classification scheme for Nigeria, which assigns weighted scores to parental (maternal and paternal) educational attainment and occupational grade and sums these into a composite household score. The composite score was then used to classify each household into one of three ordinal SES strata Upper, Middle, or Lower class reflecting established cut-points for this scheme.

Nutritional status was determined anthropometrically by converting each child's weight, length/height, and age into weight-for-age (WAZ), height/length-for-age (HAZ), and weight-for-height/length (WHZ) z-scores relative to the WHO Child Growth Standards [18] median, following WHO Anthro/AnthroPlus methodology. A z-score below -2 standard deviations (SD) but at or above -3 SD of the reference median was classified as moderate underweight (WAZ), stunting (HAZ), or wasting (WHZ) as appropriate; a z-score below -3 SD was classified as severe underweight, stunting, or wasting; and a z-score at or above -2 SD was classified as normal.

Data Analysis

Data were cleaned, coded, and analysed for descriptive and inferential statistics at a significance threshold of $p < 0.05$ (two-tailed) throughout, using standard statistical software conventions consistent

with IBM SPSS Statistics version 25. Categorical variables were summarised as frequencies and percentages. The normality of continuous anthropometric z-score distributions (WAZ, HAZ, WHZ) was assessed using the Shapiro–Wilk test; these approximated normal distributions ($p > 0.05$) and were summarised as mean $\pm$ standard deviation, whereas the Dietary Diversity Score, a bounded ordinal count, was non-normally distributed ($p < 0.001$) and was additionally summarised using the median and interquartile range (IQR).

Bivariate associations between categorical variables including SES versus food security status, SES versus dietary diversity status, and dietary diversity/food security versus nutritional status category were tested using Pearson's chi-square test of independence. Because several contingency tables contained sparse cells (expected count < 5 in a substantial proportion of cells, owing to the small Upper-SES stratum, $n = 11$), asymptotic chi-square p-values were corroborated with a Monte Carlo exact-test p-value (10,000-permutation resampling of row/column margins) to guard against small-sample bias. The strength of statistically significant associations was quantified using Cramer's V (interpreted as approximately 0.10 = weak, 0.30 = moderate, and ≥ 0.50 = strong). The relationship between the ordinal DDS and each anthropometric z-score was examined using Spearman's rank correlation, appropriate given the non-normal distribution of DDS.

To identify the independent correlates of household food insecurity while adjusting for confounding, a multivariable binary logistic regression model was fitted with household food insecurity (yes/no) as the outcome and household SES, child dietary diversity (MDD status), household size, and child age category as covariates. The household-size category of eleven or more members was collapsed into a single "greater than five members" stratum after an initial model revealed quasi-complete separation (all seven households in that category were food insecure). Effect estimates are reported as adjusted odds ratios (aOR) with 95% confidence intervals (CI).

Results

Socio-Demographic and Socioeconomic Characteristics

A total of 215 caregiver–child pairs were analysed. Socio-demographic and socioeconomic characteristics of study households. The sample was almost evenly distributed by child age (48.4% aged 6–23 months versus 51.6% aged 24–59 months) and sex (51.2% male, 48.8% female). Most households were monogamous (87.9%), Yoruba (72.6%), and of the Christian faith (57.0%). Household size was predominantly small: 73.5% comprised five or fewer members, while only 3.3% had eleven or more members. Notably, maternal educational attainment was comparatively high 58.2% of mothers had attained at least OND/NCE-level education yet 65.1% of mothers were engaged in petty trading as their primary occupation, indicating a mismatch between educational attainment and occupational/income return that is characteristic of informal urban labour markets. By composite socioeconomic score, households were predominantly Middle class (65.1%), with Lower class comprising 29.8% and Upper

class only 5.1%, a skewed distribution that constrains statistical power for Upper-class comparisons in subsequent tables and is discussed further as a study limitation (Table 1).

Table 1
Socio-Demographic and Socioeconomic
Characteristics of the Study Households (N = 215)

Variable/Category	n	%
Child age		
6–23 months	104	48.4
24–59 months	111	51.6
Child sex		
Male	110	51.2
Female	105	48.8
Family type		
Monogamous	189	87.9
Polygamous	26	12.1
Household size		
≤ 5 members	158	73.5
6–10 members	50	23.3
≥ 11 members	7	3.3
Ethnicity		
Yoruba	156	72.6
Igbo	35	16.3
Hausa	24	11.2
Religion		
Christian (n = 214)	122	57.0
Muslim (n = 214)	89	41.6
Maternal education		
OND/NCE or higher	125	58.2
Senior secondary or below	90	41.8
Maternal occupation		
Petty trading	140	65.1
Civil/public servant or professional	71	33.1

Variable/Category	n	%
Child age		
Household SES class		
Upper class	11	5.1
Middle class	140	65.1
Lower class	64	29.8

SES classified using the Ibadin and Akpede [17] revised socioeconomic scoring scheme. Percentages are column percentages of the stated denominator (default N = 215).

Household Food Insecurity

Household food insecurity. Household food security, assessed with the nine-item HFIAS, revealed a substantial burden of food access deprivation: only one in five households (19.5%) was classified as food secure, while over half (52.1%) were severely food insecure (Table 2). Anxiety and uncertainty about household food access was the most widely reported experience, affecting 62.3% of households, while the most extreme manifestation of food insecurity going a whole day and night without eating still affected a non-trivial 14.4% of households, indicating that food insecurity in this population is both widespread in its milder forms and severe for a substantial subset.

Table 2
Household Food Insecurity Access Scale (HFIAS): 30-Day Occurrence and Household Food Security Classification (N = 215)

HFIAS Occurrence Item (past 30 days)	Occurred, n (%)	Never occurred, n (%)
Worried household would not have enough food	134 (62.3)	81 (37.7)
Unable to eat preferred kinds of food	137 (63.7)	78 (36.3)
Ate a limited variety of food	135 (62.8)	80 (37.2)
Ate food not wanted, due to lack of resources	131 (60.9)	84 (39.1)
Ate smaller meals than needed	128 (59.5)	87 (40.5)
Ate fewer meals in a day	126 (58.6)	89 (41.4)
Had no food of any kind in the household	96 (44.7)	119 (55.3)
Went to sleep hungry	60 (27.9)	155 (72.1)
Went a whole day and night without eating	31 (14.4)	184 (85.6)
Overall Household Food Security Classification	n	%
Food secure	42	19.5
Mildly food insecure	24	11.2
Moderately food insecure	37	17.2
Severely food insecure	112	52.1

Classification derived using the standard HFIAS coding algorithm [16].

Child Dietary Diversity

Child dietary diversity. Food group consumption in the preceding 24 hours was strongly staple-dominated: grains, roots, and tubers were consumed by almost all children (97.2%), whereas nutrient-dense animal-source and micronutrient-rich foods were consumed far less frequently eggs by only 31.6% and vitamin-A-rich fruits and vegetables by 41.9% of children (Table 3). The mean Dietary Diversity Score was 4.0 ± 1.1 (of 7 scoreable groups), and only 32.1% of children met the WHO/UNICEF minimum dietary diversity threshold of at least five food groups, leaving two-thirds of the sample (67.9%) with a diet lacking sufficient variety a public-health-relevant gap that, as shown later (Table 6), was not confined to any single socioeconomic stratum.

Table 3
Food Group Consumption (Previous 24 Hours) and Dietary Diversity Status of
Children Aged 6–59 Months (N = 215)

Food Group	Consumed, n	Consumed, %
Grains, roots and tubers	209	97.2
Flesh foods (meat/fish/poultry)	117	54.4
Dairy products	113	52.6
Other fruits and vegetables	103	47.9
Legumes and nuts	95	44.2
Vitamin A-rich fruits and vegetables	90	41.9
Eggs	68	31.6
Breastmilk	64	29.8
DDS and MDD Status	Value	
Mean DDS (of 7 scoreable food groups) $\pm$ SD	4.0 $\pm$ 1.1	
Median DDS (IQR)	4.0 (3.0–5.0)	
Met MDD ($\geq$ 5 food groups), n (%)	69 (32.1)	
Did not meet MDD ($<$ 5 food groups), n (%)	146 (67.9)	

DDS= Dietary Diversity Score, SD= Standard Deviation, MDD = Minimum Dietary Diversity, WHO/UNICEF indicator ($\geq$ 5 of 8 food groups consumed in the previous 24 hours).

Nutritional Status

Nutritional status. Anthropometric assessment showed that stunting (chronic undernutrition) was the most prevalent form of malnutrition, affecting 19.1% of children (10.7% moderate and 8.4% severe), compared with a combined 9.3% underweight and 9.8% wasting (Table 4). The co-existence of stunting, wasting, and underweight, each present in roughly one in ten children, is consistent with a population experiencing both chronic and acute nutritional deficits concurrently, against the backdrop of high household food insecurity (Table 2) and sub-optimal dietary diversity (Table 3) already documented in this sample.

Table 4
Anthropometric Indices and Nutritional Status of Under-Five Children (N = 215)

Index	Mean $\pm$ SD	Moderate, n (%)	Severe, n (%)	Normal, n (%)
Weight-for-age (WAZ) underweight	-0.20 $\pm$ 1.42	13 (6.0)	7 (3.3)	195 (90.7)
Height/length-for-age (HAZ) stunting	-0.39 $\pm$ 1.96	23 (10.7)	18 (8.4)	174 (80.9)
Weight-for-height/length (WHZ) wasting	0.02 $\pm$ 1.76	9 (4.2)	12 (5.6)	194 (90.2)

Classification per WHO Child Growth Standards: moderate = z-score <-2 to ≥-3 SD; severe = z-score <-3 SD; normal = z-score ≥-2 SD. Shapiro–Wilk confirmed approximate normality of all three z-score distributions ($p > 0.05$).

Association between Socioeconomic Status and Household Food Security

Association between household socioeconomic status and food security. A statistically significant, dose-dependent gradient was observed between SES and household food security ($\chi^2 = 24.39$, $df = 2$, $p < 0.001$; Monte Carlo exact $p < 0.001$; Cramer's $V = 0.34$, a moderate association): food insecurity rose from 45.5% among Upper-class households to 75.0% among Middle-class households and 98.4% among Lower-class households (Table 5). Figure 1 visualises this steep, near-linear gradient across the SES continuum, making explicit that Upper-class households were the only stratum in which food-secure households did not constitute a minority, while virtually all Lower-class households (63 of 64) were food insecure identifying Lower-class SES as the strongest bivariate correlate of household food insecurity in this sample.

Table 5
Association between Household Socioeconomic Status and Household Food Security Status (N = 215)

SES Class	Food Secure, n (%)	Food Insecure, n (%)	Total
Upper (n = 11)	6 (54.5)	5 (45.5)	11
Middle (n = 140)	35 (25.0)	105 (75.0)	140
Lower (n = 64)	1 (1.6)	63 (98.4)	64
Total	42 (19.5)	173 (80.5)	215

$\chi^2 = 24.39$, $df = 2$, asymptotic $p < 0.001$, Monte Carlo exact $p < 0.001$ (10,000 permutations); Cramer's $V = 0.337$ (moderate association).

Percentage of households classified as food secure vs. food insecure, by SES class (complements Table 5).

Association between Socioeconomic Status and Dietary Diversity

Association between household socioeconomic status and dietary diversity. In marked contrast to the SES–food security relationship, dietary diversity showed no meaningful association with SES ($\chi^2 = 0.367$, $df = 2$, $p = 0.832$; Monte Carlo exact $p = 0.818$; Cramer's $V = 0.041$, negligible) (Table 6). The proportion of children failing to meet minimum dietary diversity remained consistently high across all three strata, ranging narrowly from 63.6% (Upper class) to 69.3% (Middle class), indicating that low dietary diversity in this population is a near-universal pattern not explained by the household socioeconomic gradient alone, and more plausibly reflects shared caregiver feeding practices, local food availability, or cultural dietary patterns that cut across socioeconomic strata.

Table 6
Association Between Household Socioeconomic Status and Child Dietary Diversity (MDD Status) (N = 215)

SES Class	MDD Met, n (%)	MDD Not Met, n (%)	Total
Upper (n = 11)	4 (36.4)	7 (63.6)	11
Middle (n = 140)	43 (30.7)	97 (69.3)	140
Lower (n = 64)	22 (34.4)	42 (65.6)	64
Total	69 (32.1)	146 (67.9)	215

$\chi^2 = 0.367$, $df = 2$, asymptotic $p = 0.832$, Monte Carlo exact $p = 0.818$; Cramer's $V = 0.041$ (negligible association).

Dietary Diversity, Food Security, and Nutritional Status

Dietary diversity, food security, and nutritional status. None of the six bivariate tests relating dietary diversity or food security status to underweight, stunting, or wasting reached statistical significance (all $p > 0.14$), and Spearman correlations between the Dietary Diversity Score and each anthropometric z-score were likewise negligible ($|p| < 0.08$, all $p > 0.24$) (Table 7). This null finding is itself an important result: in this cross-sectional sample, a child's most recent 24-hour dietary diversity and the household's 30-day food-access experience did not translate into a detectable difference in anthropometric outcomes, a pattern consistent with child nutritional status being shaped by a longer causal chain including illness episodes, birth weight, infant and young child feeding history, and water, sanitation, and hygiene exposures that is not captured by a single-day dietary recall or a 30-day food-access recall alone.

Table 7
Association between Dietary Diversity, Household Food Security Status, and Child Nutritional Status Indices (N = 215)

Exposure	Nutritional Outcome	χ^2 / ρ	p-value
Dietary diversity (MDD status)	Underweight (WAZ category)	$\chi^2=1.278$	0.528
	Stunting (HAZ category)	$\chi^2=0.108$	0.948
	Wasting (WHZ category)	$\chi^2=3.842$	0.147
Food security status	Underweight (WAZ category)	$\chi^2=1.830$	0.401
	Stunting (HAZ category)	$\chi^2=1.027$	0.598
	Wasting (WHZ category)	$\chi^2=1.509$	0.470
DDS (Spearman's ρ)	WAZ	$\rho = 0.003$	0.960
	HAZ	$\rho = 0.047$	0.494
	WHZ	$\rho=-0.080$	0.243

MDD status per Table 3; food security status collapsed to secure vs. any insecurity per Table 2.

Independent Correlates of Household Food Insecurity

Independent correlates of household food insecurity. In the multivariable logistic regression model (Table 8; log-likelihood = - 88.42, LR $\chi^2(5) = 35.55$, $p < 0.001$, McFadden's pseudo- $R^2 = 0.167$), household SES remained the dominant independent correlate of food insecurity after mutual adjustment: the adjusted odds of food insecurity were 4.6 times higher for Middle-class households (aOR = 4.61, 95% CI: 1.24–17.13, $p = 0.023$) and 88.4 times higher for Lower-class households (aOR = 88.40, 95% CI: 8.47–923.02, $p < 0.001$) relative to Upper-class households, confirming that the bivariate SES gradient documented in Table 5 was not attributable to confounding by dietary diversity, household size, or child age. Child dietary diversity and household size were not independent correlates of food insecurity once SES was accounted for (both $p > 0.10$), whereas households with an older child (24–59 months) had 54% lower adjusted odds of food insecurity than those with a younger child (aOR = 0.46, 95% CI: 0.22–0.99, $p = 0.047$). Figure 2 presents these estimates as a forest plot: the very wide confidence interval for Lower-class SES (8.47–923.02) is a direct consequence of the near-complete absence of food-secure Lower-class households in the sample (Table 5) and should be interpreted as evidence of a strong, robust directional effect rather than a precise point estimate, while the confidence intervals for dietary diversity and household size visibly cross the null (aOR = 1.0) line, consistent with their non-significant p-values in Table 8.

Table 8
Multivariable Logistic Regression: Independent Correlates of Household Food Insecurity (N = 215)

Predictor (reference category)	aOR	95% CI	p-value
SES: Middle vs. Upper	4.61	1.24–17.13	0.023
SES: Lower vs. Upper	88.40	8.47–923.02	< 0.001
Dietary diversity: MDD not met vs. met	1.05	0.48–2.32	0.902
Household size: >5 vs. ≤5 members	2.27	0.82–6.27	0.113
Child age: 24–59 vs. 6–23 months	0.46	0.22–0.99	0.047

Model fit: Log-likelihood = -88.42, LR $\chi^2(5) = 35.55$, $p < 0.001$, Pseudo R^2 (McFadden) = 0.167. Household-size ≥ 11 category collapsed into ">5" to resolve quasi-complete separation.

Forest plot of adjusted odds ratios (points) with 95% confidence intervals (whiskers) on a logarithmic axis (complements Table 8).

Discussion

This study examined the relationship between household socioeconomic status, child dietary diversity, household food security, and nutritional status among 215 under-five children in Ibadan South-West LGA, Oyo State, Nigeria. Four findings warrant discussion in relation to recent evidence: the high overall burden of household food insecurity; the strong, SES-graded pattern of that insecurity; the uniformly low and SES-independent dietary diversity deficit; and the absence of a detectable cross-sectional association between food access indicators and anthropometric status.

The finding that four in five households (80.5%) experienced some degree of food insecurity, over half of them severely, situates this LGA at the higher end of the range reported across recent Ibadan- and Nigeria-based studies. Oderinde, Ilesanmi, and Afolabi [5], surveying 1,027 under-five households across urban and rural slum communities in Ibadan, similarly reported a substantial burden of household food insecurity and identified it as a leading correlate of poor child anthropometric outcomes, although their slum-focused sampling frame likely captured a more uniformly disadvantaged population than the present study's deliberately SES-stratified sample. Omachi, Van Onselen, and Kolanisi [6], studying preschoolers in Niger State, North-Central Nigeria, found that 98.8% of children were from food-insecure households, with 40.3% severely food insecure figures that, while drawn from a different geopolitical zone, echo the present study's finding that severe food insecurity, not merely mild insecurity, dominates the food-security distribution in economically constrained Nigerian populations. In south-eastern Nigeria, Ukonu, Wallace, and Lowe [7] reported 82.6% household food insecurity in Nsukka LGA, and identified maternal education, age, income, and work status proxies closely related to the SES construct used here as significant correlates, a pattern directly consistent with the present study's SES gradient.

The dose-dependent SES gradient observed in this study food insecurity rising from 45.5% among Upper-class to 98.4% among Lower-class households, with Lower-class SES associated with an adjusted odds ratio of 88.4 relative to Upper-class SES is among the steepest gradients reported in the recent Nigerian literature, though direction is consistent with prior work. Nationally, socioeconomic disadvantage has repeatedly emerged as a primary driver of household food access problems in Nigeria [11], and a recent multilevel analysis of nationally representative data confirmed that socioeconomic determinants operate alongside maternal and geographic factors to shape both food security and child mortality risk [14]. The extremely wide confidence interval around the Lower-class estimate in this study (95% CI: 8.47–923.02) reflects the near-complete absence of food-secure Lower-class households in the sample rather than estimation instability per se, and should be read as strong directional evidence that Lower-class status confers overwhelming risk of food insecurity in this urban LGA, consistent with the broader finding that Nigeria's recent macroeconomic shocks currency depreciation, fuel subsidy removal, and food price inflation have disproportionately eroded the purchasing power of lower-income urban households [13].

In contrast to the strong SES–food security relationship, dietary diversity in this sample was both low overall (32.1% meeting minimum dietary diversity) and essentially unrelated to SES (63.6–69.3% failing to meet minimum diversity uniformly across strata). This pattern diverges from findings in some other contexts for instance, a pooled 32-country sub-Saharan African analysis found dietary diversity to be associated with modestly lower odds of undernutrition and, implicitly, with household resource availability [9] but is consistent with the interpretation that, once a threshold level of resource constraint is reached, dietary diversity becomes governed more by caregiver knowledge, food preparation practices, and locally available food culture than by incremental differences in household income or parental education. The near-universal reliance on starchy staples (97.2% consumption of grains/roots/tubers) alongside comparatively low consumption of eggs (31.6%) and vitamin-A-rich produce (41.9%) mirrors the feeding pattern reported by Omachi et al. [6] in North-Central Nigeria, where cereal-based foods dominated intake and fruits and vegetables were the least consumed food group, suggesting a broadly shared national pattern of low dietary diversity that transcends geopolitical zone and, per the present findings, also transcends socioeconomic class within a single urban LGA.

The absence of a statistically significant bivariate relationship between either dietary diversity or food security status and any of the three anthropometric outcomes (stunting, wasting, underweight) in this study contrasts with some pooled international evidence for example, Aboagye et al. [9] found that adequate dietary diversity was associated with modestly reduced odds of stunting, wasting, and underweight across 32 sub-Saharan African countries, and Harper et al. [10] found dietary diversity level to be significantly associated with stunting and wasting among under-five children in a South African national survey but is not without precedent in the Nigerian and regional literature. A recent household-level analysis using Nigeria Demographic and Health Survey data similarly found that dietary diversity operated jointly with numerous other maternal, household, and community factors in shaping the double burden of malnutrition, with no single exposure showing a dominant, isolated bivariate effect [13]. Several methodological features of the present study plausibly explain this null finding. First, the 24-hour recall used to derive the Dietary Diversity Score reflects only the most recent day's intake and may not

represent a child's habitual diet, particularly given known day-to-day and seasonal variation in food access. Second, anthropometric status, especially stunting, is a cumulative indicator reflecting nutritional and infectious exposures over the child's entire life course, including in utero growth restriction and infant feeding history, none of which were captured in this cross-sectional design. Third, the modest sample size, and particularly the small Upper-SES stratum ($n = 11$), limited statistical power to detect anthropometric associations of the modest magnitude typically reported in larger multi-country analyses. Taken together, these findings suggest that in this population, a single round of food-access and dietary-recall data is an insufficient proxy for the longer-term nutritional exposures that ultimately determine a child's growth status a methodological caution relevant to future single-visit nutrition surveys in comparable urban Nigerian settings.

Several study limitations should be considered when interpreting these findings. First, the cross-sectional design precludes causal inference regarding the direction of any of the observed associations, including the SES–food security relationship; longitudinal or quasi-experimental designs would be required to establish temporality. Second, the skewed distribution of the SES strata (only 5.1% Upper class, $n = 11$) limited statistical power for Upper-class comparisons and produced very wide confidence intervals around estimates involving this stratum; larger, SES-balanced samples would improve the precision of future estimates. Third, dietary diversity was assessed using a single 24-hour recall, which is susceptible to day-to-day variation and recall bias and may not represent habitual dietary patterns; repeated non-consecutive recalls would strengthen future assessments. Fourth, self-reported household food insecurity experiences, though captured using a validated and internally consistent instrument (Cronbach's $\alpha = 0.85$), remain subject to social desirability and recall bias. Finally, the study was restricted to a single LGA within Ibadan and may not be generalisable to rural Nigerian populations or to LGAs with markedly different socioeconomic compositions.

These findings carry several implications for public health nutrition programming. First, the steep SES gradient in food insecurity indicates that untargeted, universal food-security interventions may be an inefficient use of limited resources relative to programmes specifically targeted at lower-income urban households, where the burden of food insecurity is overwhelming and nearly universal. Second, the finding that dietary diversity deficits are essentially uniform across SES strata suggests that dietary-diversification interventions such as nutrition education on affordable food combinations, promotion of egg and vitamin-A-rich vegetable consumption, and kitchen-garden or homestead food production programmes should be delivered as universal, cross-cutting interventions rather than targeted solely at the poorest households, since Upper- and Middle-class caregivers in this sample were similarly likely to under-diversify their children's diets. Third, the co-existence of stunting, wasting, and underweight in this sample, despite the absence of a detectable cross-sectional dietary or food-security correlate, reinforces the need for longitudinal growth monitoring and multi-sectoral interventions addressing water, sanitation, hygiene, and infectious disease alongside dietary quality, rather than dietary interventions alone. Finally, given that household food insecurity in this sample was both highly prevalent and severely skewed toward Lower-class households, community-level social protection measures such as targeted cash transfers or subsidised food access schemes may be a more direct lever for reducing food insecurity

than nutrition education alone, which this study's findings suggest is unlikely, by itself, to resolve either the food-security or dietary-diversity deficits documented here.

Conclusions

This study found that household food insecurity was highly prevalent and severe among under-five households in Ibadan South-West LGA, that this insecurity followed a steep, statistically robust socioeconomic gradient even after adjustment for dietary diversity, household size, and child age, and that child dietary diversity was independently and uniformly inadequate across all socioeconomic strata. Contrary to some expectations, neither household food insecurity nor child dietary diversity showed a statistically detectable cross-sectional association with the co-existing burden of stunting, wasting, and underweight observed in this sample, underscoring the multifactorial and cumulative nature of child undernutrition beyond short-term food-access and dietary-recall measures. Household socioeconomic status rather than dietary diversity emerged as the dominant, independent correlate of food insecurity in this population. These findings support a dual public health strategy: SES-targeted social protection and food-security interventions for the most economically disadvantaged households, delivered alongside universal dietary-diversification and child growth-monitoring programmes that reach caregivers across the full socioeconomic spectrum.

Abbreviations

aOR	Adjusted Odds Ratio
CI	Confidence Interval
DDS	Dietary Diversity Score
FANTA	Food and Nutrition Technical Assistance Project
HAZ	Height-for-Age Z-score
HFIAS	Household Food Insecurity Access Scale
LGA	Local Government Area
MDD	Minimum Dietary Diversity
SD	Standard Deviation
SES	Socioeconomic Status

UNICEF
United Nations Children's Fund
WAZ
Weight-for-Age Z-score
WHO
World Health Organization
WHZ
Weight-for-Height Z-score

Declarations

Ethics approval and consent to participate

Ethical approval for the parent study was obtained from the Lead City University Research Ethics Review Board [LCU-REC/23/275] prior to data collection, in accordance with the principles of the Declaration of Helsinki. Permission to conduct the study was additionally sought and obtained from the leadership of each selected community. Written or verbal informed consent, as appropriate, was obtained from the mother or primary caregiver of each participating child prior to questionnaire administration and anthropometric assessment, after the purpose, procedures, confidentiality safeguards, and voluntary nature of participation including the right to decline or withdraw at any point without consequence had been explained in the participant's preferred language (English or Yoruba). All data were anonymised at the point of entry and stored securely, with access restricted to the research team.

Consent for publication

Not applicable. This manuscript does not contain any individual person's data in any identifiable form, including images, videos, or personal identifiers.

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

HGF and EOA – Aleru conceived and designed the study, supervised data collection, and contributed to drafting the manuscript. DDA, and EOA – Aleru contributed to study design and critically reviewed the

manuscript. DDA and JGI, performed the formal analysis, interpreted the data, and drafted and revised the manuscript. JGI and ASA contributed to data collection and manuscript review. EOA – Adewuyi and KPO contributed to data collection and manuscript review. ASA contributed to data curation and reviewed the manuscript. All authors read and approved the final manuscript.

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Not applicable

Data Availability

The datasets generated and/or analysed during the current study are available from the corresponding author on reasonable request.

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Figures

Figure 1. Household Food Security Status by Socioeconomic Class

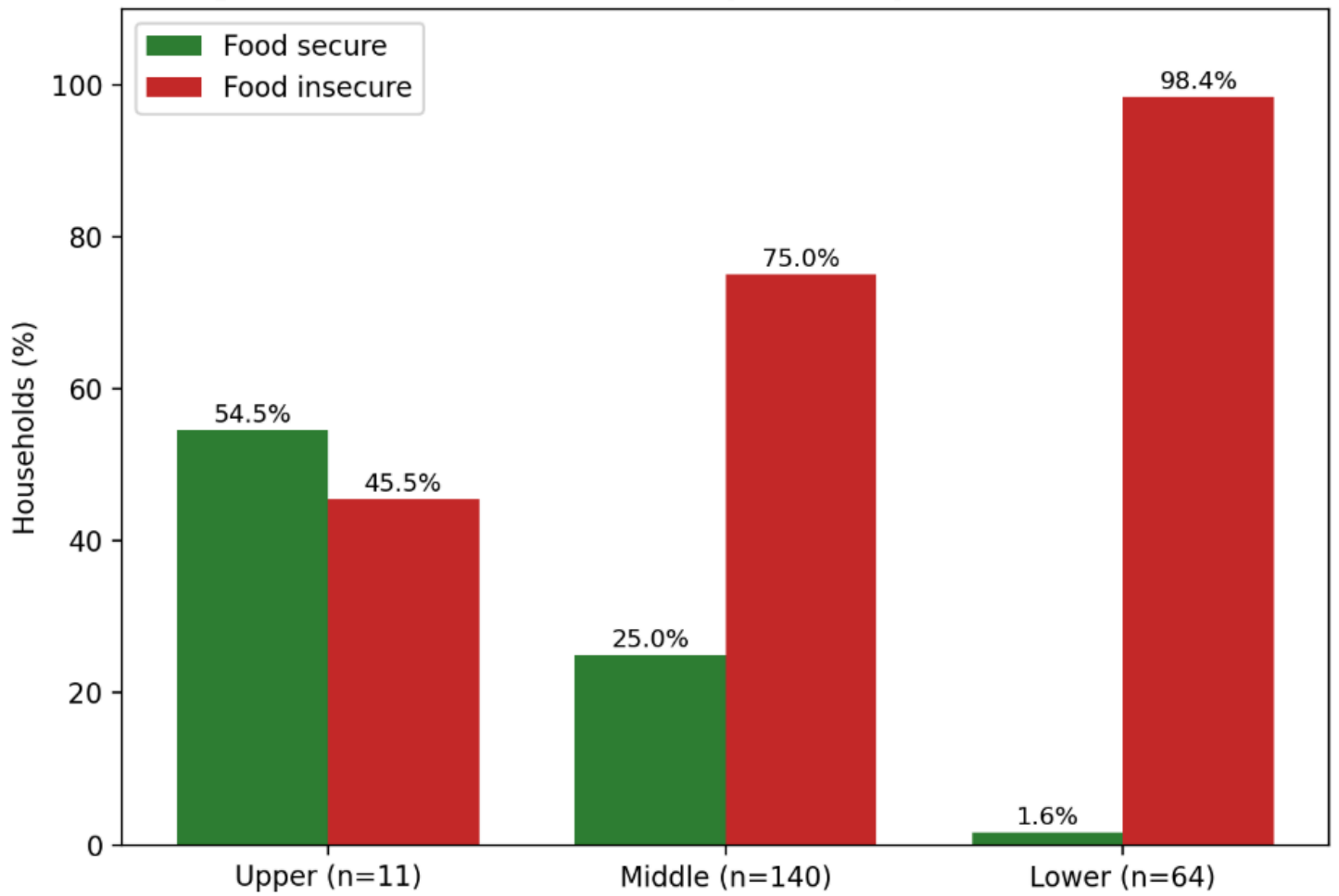


Figure 1

Percentage of households classified as food secure vs. food insecure, by SES class (complements Table 5).

Figure 2. Adjusted Odds Ratios for Independent Correlates of Household Food Insecurity

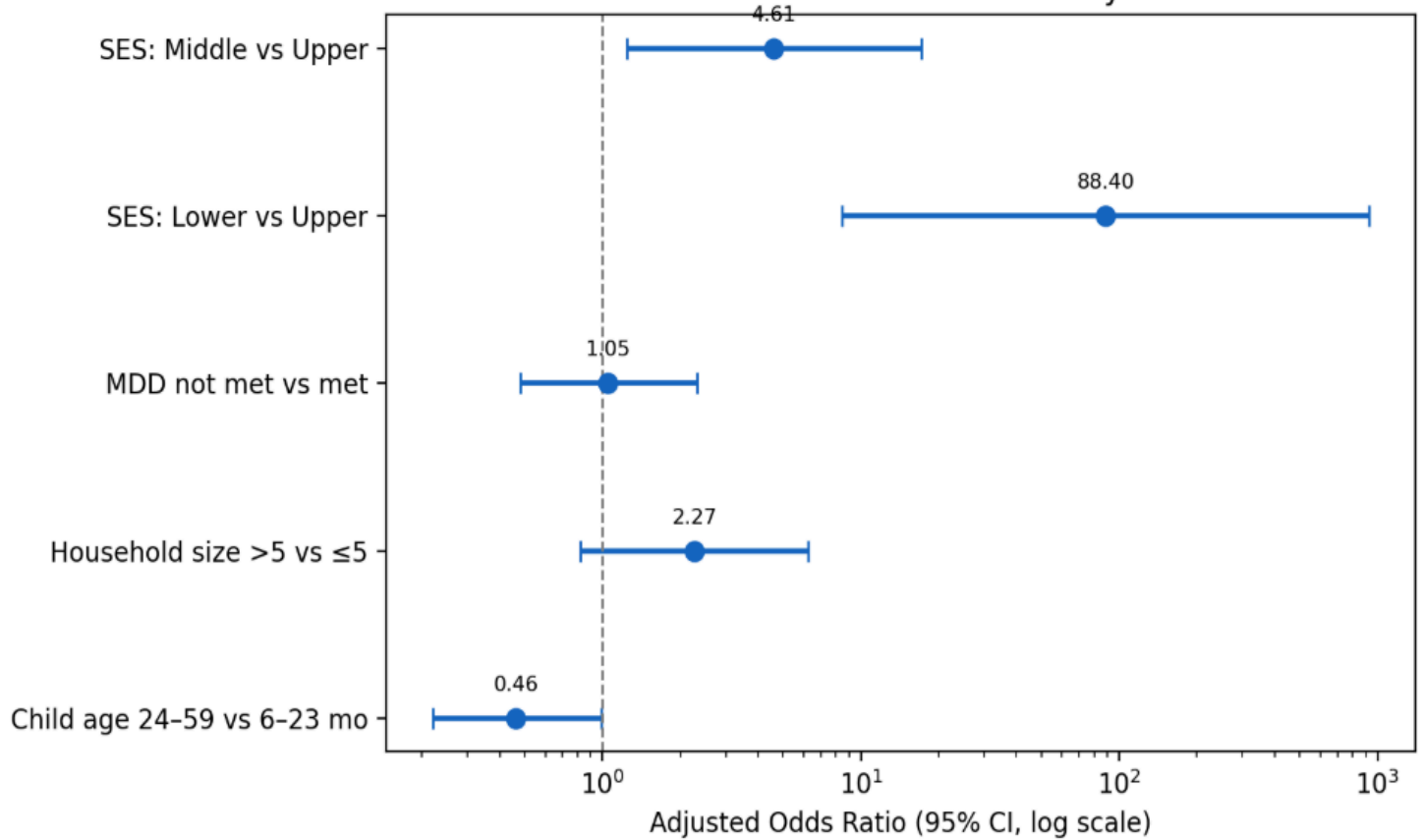


Figure 2

Forest plot of adjusted odds ratios (points) with 95% confidence intervals (whiskers) on a logarithmic axis (complements Table 8).