ISSN: 2572-5971

Research Article

Advances in Nutrition & Food Science

Dietary Diversity Score and Weight-For-Height Status of Preschool Children in Semi-Urban and Rural Communities of Umuahia South Local Government Area, Abia State, Nigeria

Blessing K Nwofia[1*], Ijioma Okorie[2], Emeka K Agina[3] and Nkemdilim J Ekeowa[1]

[1]*Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture Umudike, Nigeria*

[2]*Department of Public Health, Cosmopolitan University Abuja, Nigeria*

[3]*Department of Hotel Tourism and Management, Michael Okpara University of Agriculture Umudike*

[*]Corresponding Author
Blessing K Nwofia, Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture, Nigeria.

Submitted: 2026, Mar 20; **Accepted:** 2026, Apr 27; **Published:** 2026, May 07

Citation: Nwofia, B. K., Okorie, I., Agina, E. K., Ekeowa, N. J. (2026). Dietary Diversity Score and Weight-For-Height Status of Preschool Children in Semi-Urban and Rural Communities of Umuahia South Local Government Area, Abia State, Nigeria. *Adv Nutr Food Sci, 11*(1), 01-10.

Abstract

Background/ Objective: *Proper nutrition in the preschool years is vital for healthy growth, brain development, and lifelong well-being. The study was to assess the dietary diversity score and weight-for-height status of preschool children in semi-urban and rural communities of Umuahia South Local Government Area, Abia State, Nigeria.*

Methods: *A community-based cross-sectional study was conducted among 318 preschool children aged 2–4 years and their caregivers, selected from six randomly chosen communities using a multi-stage sampling technique. Socio-demographic and individual dietary diversity score (IDDS) data were collected using a semi-structured questionnaire. Children's weight and height were measured and analyzed using WHO Anthro software to obtain Z-scores for weight-for-height, weight-for-age, and height-for-age. Descriptive statistics and Chi-square tests were used to analyze the data, with significance set at $p < 0.05$.*

Results: *The mean age of children was 2.86 ± 0.79 years; 52.8% were male. Most households were small (1–5 members; 64.5%) and low-income (< ₦70,000/month; 66.4%). Caregivers mostly had secondary education (62.9%), with trading (34.3%) and civil/public service (33.0%) as predominant occupations. Dietary assessment showed universal consumption of grains, roots, and tubers (100%), while intake of animal-source foods, eggs, and vitamin A-rich fruits and vegetables was low. More than half of the children (52.8%) did not meet minimum dietary diversity (≥4 food groups). Anthropometric measurements revealed stunting (25.5%), underweight (15.7%), wasting (7.9%), and overweight/obesity (3.1%). Wasting was significantly associated with low dietary diversity ($p = 0.001$), larger household size ($p = 0.010$), low household income ($p = 0.030$), and lower maternal education ($p = 0.049$).*

Conclusions: *Dietary diversity, household size, household income, and maternal education significantly influenced weight-for-height status. Interventions targeting improved dietary diversity and socio-economic support are needed to enhance nutritional outcomes among preschool children.*

Keywords: Dietary Diversity Score, Weight-For-Age, Preschool Children

1. Introduction

Childhood nutrition is a fundamental determinant of physical growth, cognitive development, and long-term health, particularly during the preschool years when rapid physical and neurological development occurs [1]. Adequate dietary intake during this critical stage is essential to prevent malnutrition in all its forms, including undernutrition, micronutrient deficiencies, and the emerging double burden of overweight and obesity (World Health Organization) [2]. Globally, child malnutrition remains a major public health challenge, with millions of children under five affected by stunting and wasting, the burden being disproportionately concentrated in low- and middle-income countries. In 2022, 149 million children under 5 were estimated to be stunted (too short for age), 45 million were estimated to be wasted (too thin for height), and 37 million were overweight or living with obesity [3].

In Nigeria, the nutritional status of preschool children continues to pose serious health and developmental concerns, particularly in semi-urban and rural communities where access to diverse and nutrient-dense foods may be limited. Recent findings from the National Population Commission in collaboration with ICF through the Nigeria Demographic and Health Survey reveal persistent and worsening levels of undernutrition among children under five years of age. Nationally, stunting increased from 37% in 2018 to 40% in 2023/24, underweight rose from 22% to 27%, while wasting increased from 7% to 8% within the same period. These figures underscore a troubling trend and highlight the urgent need for intensified efforts to address both acute and chronic forms of malnutrition (Federal Ministry of Health and Social Welfare of Nigeria (FMoHSW), National Population Commission (NPC) [4].

Although national statistics provide an overall picture, substantial disparities exist across regions, states, and between rural and semi-urban communities. These differences reflect variations in socioeconomic status, household food security, maternal education, healthcare access, environmental sanitation, and infant and young child feeding practices. In many rural areas, diets are heavily dependent on staple foods such as cereals and tubers, with limited intake of animal-source foods, fruits, and vegetables. Conversely, semi-urban settings are increasingly exposed to processed and energy-dense foods, creating a complex nutritional environment characterized by both undernutrition and emerging overweight.

Dietary diversity has been widely recognized as a key indicator of diet quality and micronutrient adequacy. The Dietary Diversity Score (DDS), promoted by the Food and Agriculture Organization, measures the number of different food groups consumed over a specified reference period and serves as a practical proxy for nutrient adequacy in young children [5]. A high DDS is generally associated with improved micronutrient intake and better growth outcomes, while a low DDS common in resource-constrained Nigerian households often results in "hidden hunger," characterized by deficiencies in essential vitamins and minerals despite sufficient caloric intake.

Anthropometric assessment remains central to evaluating child nutritional status. Among the standard indices, weight-for-height (WHZ) is particularly important for assessing acute malnutrition. Unlike height-for-age, which reflects chronic nutritional deprivation, weight-for-height indicates current nutritional status and responds rapidly to recent changes in dietary intake or illness. Children with low weight-for-height are classified as wasted, signifying acute undernutrition, whereas those with high weight-for-height may be considered overweight. Thus, weight-for-height provides a sensitive measure for identifying immediate nutritional risks and monitoring short-term changes in growth.

In Umuahia South Local Government Area of Abia State, socioeconomic conditions, cultural feeding patterns, and differences in food access between rural and semi-urban communities are likely to influence children's dietary diversity and, consequently, their anthropometric outcomes. Rural households often rely on subsistence agriculture with seasonal variability in food availability, while semi-urban households may experience dietary transitions influenced by market access and the availability of processed foods. Despite growing national concern about childhood malnutrition, there remains a paucity of localized empirical data examining the relationship between dietary diversity and weight-for-height status among preschool children in these distinct community settings.

Therefore, this study aims to assess the DDS and weight-for-height status of preschool children in semi-urban and rural communities of Umuahia South LGA. By comparing these two settings, the study seeks to provide context-specific evidence to inform targeted nutrition interventions and guide public health planning.

2. Methods

2.1. Study Design

A community-based cross-sectional design was used to simultaneously assess HDDS and nutritional status among preschool children in semi-urban and rural communities in Umuahia South [6].

2.2. Area of Study

Umuahia South Local Government Area (LGA) is in Abia State, Nigeria. The Igbo ethnic group predominantly inhabits the area with a population of approximately 139,000 people in 2006, projected to be about 203,000 now. Predominantly agrarian livelihoods characterise Umuahia South LGA, where households are engaged in subsistence farming and small-scale trading [4]. The region experiences seasonal variations in food availability, which impacts dietary diversity and nutritional outcomes, a situation analogous to those documented in Ghana and Tanzania [7]. The study was conducted in semi urban and rural communities within the LGA [6].

2.3. Sampling Procedure

The study population comprised all preschool children aged 2–4 years and their primary caregivers residing in the selected communities. A total of 318 preschool children and caregivers

participated in the study. The sample size was determined using Cochran's single proportion formula, considering the estimated prevalence of undernutrition among preschool children in similar rural settings, a margin of error of 5%, and a 95% confidence level. Adjustments were made for potential non-response (5%) based on similar methodologies employed in studies by Azupogo et al and Khamis et al. [7,8].

$$n = \frac{Z^2 \times p\,(1-p)}{e^2}$$

Where:

- Z is the z-score corresponding to a 95% confidence interval (1.96)
- P is the estimated prevalence of undernutrition – underweight, 27% (NDHS, 2024); and e is the margin of error (0.05).

$$n = \frac{1.96^2 \text{ x } 0.27 \text{ x } (1 - 0.27)}{0.05^2}$$

The sampling procedure used in the study was as reported by Okorie et al. [6]. The study employed a multi-stage sampling method. The LGA was stratified into semi-urban and rural communities to ensure representation across these groups. The sample size of 318 preschool children was allocated across the areas, with 60% from semi-urban areas (due to anticipated high population density) and 40% from rural areas. Six communities were randomly selected from a list of wards, three from each of the semi-urban and rural areas. Within each selected community, households were sampled using systematic sampling, yielding 64 preschool children per semi-urban community and 42 per rural community. A random starting point was chosen in each community, and every fifth household was selected. In households with multiple eligible preschool children, simple random sampling was used to select one preschool child.

2.4. Dietary Assessment

Information on the child's age, gender, and caregiver's socioeconomic characteristics was collected using a questionnaire. Individual dietary diversity score (IDDS) was assessed using a culturally specific, modified dietary diversity score adapted from the FANTA project (version 2) [9]. Caregivers were asked to recall all foods consumed by their preschool children in the previous 24 hours. Data on various food groups consumed on the preceding day, adapted for local dietary practice, were collected. The data collection was conducted in local languages, and eight food groups (IDDS) was used, as indicated in Table 1 [6].

Food Groups	**Examples**
Starchy foods	Rice, bread, pap, potatoes, fufu, plantain
Pulses, nuts & seeds	Beans, moi-moi, African yam beans, groundnut, melon seed, walnut, breadfruit seed, ogbono seed, cashew nut
Dairy products	Milk powder, liquid milk, ice-cream, yoghurt
Flesh foods	Cow meat, fish, goat meat, chicken, turkey, pork, prawn, crab, shrimp
Egg	Egg
Dark green leafy vegetables	Pumpkin leaf, waterleaf, bitter leaf, *uziza, utazi, okazi*, garden egg leaf
Vitamin A-rich fruits and vegetables	Carrots, sweet potatoes, red *tatase*, pumpkin, mango, pawpaw, *ogbono* fruit
Other fruits/vegetables	Okra, tomatoes, sweet potato leaf, cowpea leaf, green pepper, green beans, avocado pear, orange, tangerine, banana, grapefruit, guava
Source: Okorie et al. [6].	

Table 1: Food Groups

The population level indicator for the dietary diversity of the preschool children was: Preschool children who consumed food from at least four of eight food groups during the previous 24 hours/Total number of preschool children.

Anthropometric Measurement: A Salter (London) weighing scale (checked for zero adjustment before each measurement) was used to measure the weight of the preschool children, and a stadiometer was used to measure their height. Measurement were taken to the nearest 0.1 kg and 0.1 cm, for weight and height, respectively. The anthropometric data were processed using WHO Anthro-Software to calculate Z-score for height-for-age, weight-for-age, and weight-for-height, with values < -2 SD, in accordance with WHO Growth Standards [10].

Data Analysis: Data were coded, entered, and cleaned using Excel (2013 version) and then imported to IBM-SPSS version 27. The analysis began with descriptive statistics to summarise background information, socioeconomic data, IDDS (further classified into those with a low dietary diversity [LDD] – when an individual's diet lacks variety, consuming foods only from a few food groups – and those that achieved the minimum dietary diversity [MDD], and anthropometric measurements. Inferential statistical methods were used to examine the relationships among IDDS, and anthropometric status in these preschool children. Chi-square test was used to identify significant associations between

IDDS, socio-demographic variables, and categorical variables (wasting). Statistical significance level was set at $p < 0.05$ [6].

3. Results

3.1. Socio-Demographic Characteristics of Preschool Children and Their Caregivers

Table 2 below shows the sociodemographic characteristics of preschool children and their caregivers. All (100%) preschool children in the study were within the age range of 2–4 years, with a mean age of 2.86 ± 0.79 years, indicating that the sample consisted of early preschool aged children.

Slightly more than half (52.8%) of the children were male, while females accounted for 47.2% of the total gender. This shows a balanced distribution of gender with a small predominance of males.

The majority (89.9%) of caregivers identified as Christians. A smaller proportion (6.3%) practiced traditional religion while 3.8% were Muslims. In terms of ethnicity, majority (94.0%) of the respondents were Igbo, with small proportions of Yoruba (3.5%) and Hausa (2.5%). There were no respondents from the Efik /Ibibio ethnic group. This indicate that Christianity was the dominant religion among the study population.

The mean household size was 5.71 ± 1.10 persons. Most (64.5%) of the households had between 1–5 members, while 35.5% had six or more members, indicating that a good proportion of the families were relatively large.

Regarding educational attainment of caregivers, most (62.9%) of the caregivers had secondary education, about one-quarter (25.2%) had tertiary education, while 8.8% had primary education and 3.1% had no formal education. This suggests that most care givers attained at least secondary education.

In terms of occupation, trading (34.3%) and civil/public service (33.0%) were the most common occupations among caregivers. Artisans constituted 17.0%, while 12.6% were unemployed. Only 3.1% were employed in the private sector. This result indicates that trading and public service were predominant sources of livelihood.

With respect to income level, the majority (66.4%) of households earned less than ₦70,000 monthly, 24.8% earned between ₦70,000 and ₦100,000, while only 8.8% earned above ₦100,000. Using the exchange rate of USD $1 = ₦1,451.5, most households were in the lower income category.

Variables	Frequency (n = 318)	Percentage
Age (mean age = 2.86 ± 0.79)		
2-4 years	318	100
Gender		
Male	168	52.8
Female	150	47.2
Religion		
Christianity	286	89.9
Islam	12	3.8
Traditional	20	6.3
Ethnicity		
Igbo	299	94.0
Hausa	8	2.5
Yoruba	11	3.5
Efik/Ibibio	-	-
Household size (5.71 ± 1.10)		
1 – 5	205	64.5
6 and above	113	35.5
Education attained		
No formal education	10	3.1
Primary education	28	8.8
Secondary education	200	62.9
Tertiary education	80	25.2
Occupation		
Civil/Public servant	105	33.0

Trading	109	34.3
Artisan	54	17.0
Private sector employed	10	3.1
Unemployed	40	12.6
Income level		
< N70,000	211	66.4
N70,000 – N100,000	79	24.8
Above N100,000	28	8.8
USD $1 = N1,451.5. Source: Okorie et al. (2025).		

Table 2: Socio-Demographic Characteristics of Preschool Children and Their Caregivers

3.2. Food Groups Consumed By Sample Preschool Children during the Previous 24 Hours

Table 3 shows the food groups consumed by sample preschool children during the previous 24 hours.

All (100.0%) of the preschool children consumed grains, roots, and tubers within the previous 24 hours, indicating that this food group formed the staple in their diets.

More than half (56.9%) of the children consumed legumes, nuts, or seeds, while 43.1% did not consume this food group. This shows moderate intake of plant-based protein sources among the children.

Less than half (45.6%) of the children consumed meat, poultry, fish, or seafood, whereas a slightly higher proportion (54.4%) did not consume these animal protein sources during the reference period (24 hours).

Similarly, 46.9% of the children consumed milk and milk products, while 53.1% did not, indicating that dairy consumption was not common among more than half of the sample.

Only few (18.6%) of the children consumed eggs, while a large majority (81.4%) did not consume eggs in the previous 24 hours. This shows relatively low egg consumption among the children Consumption of vitamin A-rich fruits and vegetables was also low, as only 14.8% of the children consumed them, while 85.2% did not. This indicates limited intake of micronutrient-rich foods.

Regarding other fruits and vegetables, 39.9% of the children consumed them, whereas 60.1% did not, suggesting that overall fruit and vegetable intake was relatively low.

A high proportion of the children (92.8%) consumed fats and oils, while only 7.2% did not, indicating that fats and oils were commonly included in meals.

Food groups	Frequency (n = 318)	Percentage (%)
Grains, roots/tubers		
Yes	318	100.0
No	0	0.0
Legumes, nuts/seeds		
Yes	181	56.9
No	137	43.1
Meat/poultry, fish, seafood		
Yes	145	45.6
No	173	54.4
Milk and milk products		
Yes	149	46.9
No	169	53.1
Eggs		
Yes	59	18.6
No	259	81.4
Vitamin A-rich fruits and vegetables		
Yes	47	14.8
No	271	85.2
Other fruits/vegetables		
Yes	127	39.9
No	191	60.1

Fats and oil		
Yes	295	92.8
No	23	7.2
Source: Okorie et al. [6].		

Table 3: Food Groups Consumed By Sample Preschool Children during the Previous 24 Hours

3.3. Minimum Dietary Diversity among Preschool Children

Table 4 shows the minimum dietary diversity among preschool children. The overall mean 3.41 ± 0.16 indicated that on average, the children consume slightly more than three food groups.

More than half (52.8%) of preschool children had low dietary diversity, (consumed three or fewer food groups within the previous 24 hours). This indicates that a greater proportion of the children did not meet the recommended minimum dietary diversity.

On the other hand, 47.2% of the children met the minimum dietary diversity (MDD), which consumed four or more food groups.

Overall, a larger proportion of preschool children had low dietary diversity compared to those who achieved the minimum dietary diversity.

Dietary diversity	Frequency (n = 318)	Percentage (%)	Mean ± SD
Low diversity (≤ 3 food groups)	168	52.8	3.41 ± 0.16
MDD (≥ 4 food groups)	150	47.2	
MDD = minimum dietary diversity. Source: Okorie et al. [6].			

Table 4: Minimum Dietary Diversity among Preschool Children

3.4. Anthropometric Status of the Preschool Children

Table 5 shows the anthropometric status of the preschool children.

Less than half (47.8%) of the preschool children had normal anthropometric status, indicating that they fell within the expected growth standards.

Stunting was observed in 25.5% of the children, showing that about one-quarter experienced chronic undernutrition. A few (7.9%) numbers of the children were wasted, indicating acute undernutrition affecting a smaller proportion of the sample, while 15.7% of the children were observed to be underweight reflecting a combination of acute and/or chronic undernutrition.

A small proportion (3.1%) of the children were overweight, indicating the presence of overnutrition among a minority.

Overall, more than half (52.2%) of the preschool children had one form of malnutrition, with stunting being the most prevalent nutritional problem among them.

Indicator	Frequency (n = 318)	Percentage (%)
Normal	152	47.8
Stunting	81	25.5
Wasting	25	7.9
Underweight	50	15.7
Overweight or obese	10	3.1
Source: Okorie et al. (2025).		

Table 5: Anthropometric Status of the Preschool Children

3.5. Factors Associated With Weight-For-Height of Preschool Children

Table 6 shows the association with weight for height for preschool children.

There is a significant association (p=0.001) between dietary diversity score (DDS) and wasting among the preschool children.

Among children with low dietary diversity (LDD), 17.1% were wasted, while 11.6% among those who met the minimum dietary diversity (MDD) were wasted. A higher proportion of children with adequate dietary diversity was normal (88.4%) compared to those with low dietary diversity (82.9%).

There is no significant association (p=0.050) child's sex and wasting. Wasting was observed in 14.0% of males and 14.3% of females. The proportion of normal weight-for-height status was also similar between males (86.0%) and females (85.7%). Household size showed a statistically significant association (p = 0.010) with wasting among preschool children. Children from large households had a higher prevalence of wasting (21.1%) compared to those from small households (8.9%). Conversely, a greater proportion of children from small households were normal (91.1%) compared to those from large households (78.9%).

Similarly, there is a significant association (p = 0.030) between wasting and household income, with wasting being observed among 17.6% of children from low-income household being wasted and 10.9% of those from high income households. A higher percentage (89.1%) of children from high-income households had normal weight-for-height compared to those from low-income households (82.4%). Also, Mother's education showed a significant association with wasting (p = 0.049). Wasting was slightly higher among children whose mothers had lower education (15.1%) compared to those whose mothers had higher education (13.1%). The proportion of children with normal weight-for-height was slightly higher among those whose mothers had higher education (86.9%) compared to lower education (84.9%).

Overall, dietary diversity, household size, household income, and mother's education were significantly associated with weight-for-height status, while child's sex showed no significant association.

Indicator Wasting	**Factors**		**p-value**
	DDS (Child)		
	LDD	MDD	0.001
Wasted	14(17.1)	11(11.6)	
Normal	68(82.9)	84(88.4)	
	Child sex		
	Male	Female	0.050
Wasted	12(14.0)	13(14.3)	
Normal	74(86.0)	78(85.7)	
	Household size		
	Small	Large	0.010
Wasted	9(8.9)	16(21.1)	
Normal	92(91.1)	60(78.9)	
	Household income		
	Low	High	0.030
Wasted	15(17.6)	10(10.9)	
Normal	70(82.4)	82(89.1)	
	Mother's education		
	Low	High	0.049
Wasted	14(15.1)	11(13.1)	
Normal	79(84.9)	73(86.9)	

Table 6: Factors Associated With Weight-For-Height of Preschool Children

4. Discussion

The findings of this study provide important insights into the socio-demographic profile, dietary patterns, dietary diversity, nutritional status, and factors associated with wasting among preschool children.

The children in this study were within the early preschool age (mean age 2.86 ± 0.79 years), a critical growth and development period. The slight male predominance (52.8%) is consistent with patterns reported in the National Demographic and Health Survey (NDHS 2018), as well as community-based studies in Nigeria and Ghana, where male children slightly outnumbered females in household samples [11,12].

The dominance of Christianity (89.9%) and Igbo ethnicity (94.0%) reflects the sociocultural structure of South-East Nigeria, which is predominantly Igbo and Christian. The mean household size of 5.71 persons is comparable to the national average household size reported by the National Bureau of Statistics , which ranges between 5–6 persons per household [13]. Larger household sizes may increase dependency ratios and strain household food resources.

Educational attainment of caregivers showed that most had at least secondary education (62.9%), while 25.2% had tertiary education. Maternal education is consistently identified as a strong determinant of child nutritional outcomes. According to WHO , higher maternal education is positively associated with improved child feeding practices, dietary diversity, and health-seeking behaviors [14]. NDHS (2023/24) also demonstrates that children of mothers with secondary higher education are less likely to be stunted compared to those whose mothers have no formal education. It showed that children of mothers with secondary education had stunting prevalence of 28.9%, those with tertiary education 14.0% and no education with 55.1% prevalence of stunting. Studies by Fadare et al. and Adekanmbi et al. also reported better nutritional outcomes among children of educated mothers [15,16].

Regarding occupation, trading (34.3%) and civil/public service (33.0%) were the predominant sources of livelihood. This reflects the economic structure of many semi-urban communities in southeastern Nigeria, where informal trading plays a major economic role. This result is closely related to the findings from the National Bureau of Statistics reports that a significant proportion (34%) of Nigeria's working population is engaged in informal sector activities, including petty trading and small-scale enterprises, 12% unemployed and 3% formal private sector. Employment type can influence household income stability and food purchasing power [17].

The dietary pattern of the preschool children was characterized by universal consumption of grains, roots, and tubers (100%), confirming heavy reliance on starchy staples. This aligns with findings from the Food and Agriculture Organization, which reports that diets in many low- and middle-income countries are predominantly cereal-based [18].

However, intake of animal-source foods was low. Only 45.6% consumed meat/fish, 46.9% consumed milk products, and 18.6% consumed eggs. The National Demographic and Health Survey similarly report suboptimal consumption of eggs and flesh foods among Nigerian children, contributing to poor dietary diversity. Egg consumption below 30% has been widely reported in several Nigerian regions, consistent with the 18.6% observed in this study. A study by Okafor et al. also reported egg as one of the least consumed food (37.2%) [19].

Consumption of vitamin A-rich fruits and vegetables (14.8%) was particularly low. The World Health Organization highlights inadequate fruit and vegetable intake as a key contributor to micronutrient deficiencies globally [20]. A study by Osunu et al., reported that 40.8% children are fed with vegetables and fruits only once a week. Low intake of these food groups may predispose children to vitamin A deficiency and impaired immunity [21].

More than half (52.8%) of the children had low dietary diversity (≤3 food groups), while only 47.2% met the Minimum Dietary Diversity (MDD ≥4 food groups). According to WHO and UNICEF guidelines, consumption of at least four food groups is the minimum indicator of adequate dietary diversity for young children. The prevalence of MDD in this study is comparable to national estimates reported in the National Demographic and Health Survey, where many children fail to meet recommended dietary diversity standards and only 12.4% of children aged 6 to 23 months fed with minimum dietary diversity. In rural SouthWest Nigeria, approximately 48.6% of underfive children achieved the minimum dietary diversity, reflecting similarly low diversity levels outside national surveys [22].

Little below half (47.8%) of the children had normal nutritional status, while 52.2% had one form of malnutrition. Stunting (25.5%) was the most prevalent form, followed by underweight (15.7%), wasting (7.9%), and overweight (3.1%). The stunting prevalence (25.5%) is slightly lower but comparable to the national stunting prevalence reported in the National Demographic and Health Survey, which showed 40% nationally. Wasting (7.9%) is within the range reported nationally (8%) and that of Quadri et al., which reported 6.8% wasting, while overweight (3.1%) reflects the emerging double burden of malnutrition noted by the World Health Organization. [22]

The high proportion of stunting suggests chronic undernutrition, which may be linked to prolonged inadequate dietary intake, recurrent infections, and socioeconomic constraints. Dietary diversity showed a significant association with wasting ($p = 0.001$). Children with low dietary diversity were more likely to be wasted (17.1%) compared to those who met MDD (11.6%). This finding is consistent with previous studies. Adeomi et al. reported a significant association between dietary diversity and wasting ($p = 0.018$), while Obekpa et al. found that improved dietary diversity significantly reduced the likelihood of wasting among Nigerian children ($p < 0.01$) [23,24].This supports WHO recommendations that improved dietary diversity reduces the risk of acute malnutrition [25].

Household size was significantly associated with wasting ($p = 0.010$), with higher prevalence among children from large households (21.1%). A study by Atoloye et al. reported that households with a higher number of under-five children were significantly associated with increased risk of wasting [26]. Larger families may experience intra-household food competition and limited resource allocation. These findings support the role of large household size as a key socio-economic factor influencing acute malnutrition in Nigerian children.

Household income was also significantly associated with wasting ($p = 0.030$). Children from low-income households had higher wasting prevalence (17.6%) compared to those from higher-income households (10.9%). This finding aligns with national poverty data from the National Bureau of Statistics, which indicate that low household income is strongly linked to food insecurity and child malnutrition [27]. Similarly, Akombi et al. found that undernutrition are more concentrated among children from poorer households [28].

Mother's education showed a statistically significant association (p = 0.049), with slightly higher wasting among children of less-educated mothers. Educated mothers may have better knowledge of nutrition, hygiene, and health-seeking behavior, positively influencing child nutritional status. This aligns with findings by Fadare et al., who reported that higher maternal nutrition-related knowledge and education are independently and positively associated with children's height-for-age (HAZ) and weight-for-height (WHZ) scores in Nigeria [15]. Similar associations have been reported in NDHS 2023/24 analyses which demonstrate that children of mothers with higher education are less likely to be wasted compared to those whose mothers have no formal education. It showed that children of mothers with secondary education had wasting prevalence of 9.1%, those with tertiary education 6.4%, primary education 7.6% and no education with 8.7 prevalence of wasting.

Child's sex was not significantly associated with wasting (p = 0.050), consistent with national findings showing minimal gender differences in acute malnutrition. Our finding that child's sex was not significantly associated with wasting is consistent with evidence from pooled African DHS data showing little to no significant gender difference in wasting prevalence among boys and girls across a large multicountry sample [29].

5. Conclusion

The study showed that many preschool children in semi-urban and rural communities of Umuahia South LGA, Abia State, failed to achieve minimum dietary diversity, with diets largely reliant on staple foods and low in animal-source foods, eggs, and vitamin A-rich fruits and vegetables. Stunting emerged as the most common form of malnutrition, followed by underweight, wasting, and a small prevalence of overweight, reflecting the coexistence of undernutrition and emerging overnutrition. Weight-for-height status was significantly influenced by dietary diversity, household size, household income, and mother's education, while child sex had no notable effect, indicating that children from larger, lower-income households or with less-educated mothers were at greater risk of wasting. These findings highlight the urgent need for targeted, context-specific nutrition interventions that promote diverse diets, enhance caregiver knowledge, and address socio-economic barriers to support optimal growth and development in preschool children.

References

1. Bustamante-Sanchez, A., Villegas-Mora, B. E., Martínez-Guardado, I., Tornero-Aguilera, J. F., Ardigò, L. P., Nobari, H., & Clemente-Suárez, V. J. (2022). Physical activity and nutritional pattern related to maturation and development. Sustainability, 14(24), 16958.
2. WHO, U. (2021). Indicators for assessing infant and young child feeding practices: definitions and measurement methods [Internet]. *World Health Organization, Geneva*.
3. World Health Organization. (2023). *Levels and trends in child malnutrition child malnutrition: UNICEF/WHO/World Bank Group Joint Child Malnutrition Estimates: Key findings of the 2023 edition*. World Health Organization.
4. National Population Commission. (2013). *Nigeria demographic and health survey 2013*. National Population Commission, ICF International.
5. Lyon, D., Chinedu, C., & Maylone, E. (2025). Capacity Development as a Tool for Sustainable Agricultural Development: Policy Reflections from MSU's Training Program.
6. Okorie, I., Nwofia, B. K., Agina, E. K., & Ekeowa, N. J. (2025). Household dietary diversity and nutritional status of preschool children in semi-urban and rural communities of Umuahia South Local Government Area, Abia State, Nigeria. *World Nutrition, 16*(4), 133-139.
7. Azupogo, F., Chapirah, J., & Halidu, R. (2022). The association between dietary diversity and anthropometric indices of children aged 24-59 months: A cross-sectional study in northern Ghana. *African Journal of Food, Agriculture, Nutrition and Development, 22*(7), 20829-20848.
8. Khamis, A. G., Mwanri, A. W., Ntwenya, J. E., & Kreppel, K. (2019). The influence of dietary diversity on the nutritional status of children between 6 and 23 months of age in Tanzania. *BMC pediatrics, 19*(1), 518.
9. Swindale, A., & Bilinsky, P. (2006). Household dietary diversity score (HDDS) for measurement of household food access: indicator guide. *Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development, 220*.
10. World Health Organization. (2006). *WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development*. World Health Organization.
11. Chen, S., Makori, N., & Mshida, H. A. (2025). Economic Inequalities in Triple Burden of Malnutrition in Low-and Middle-Income Countries: The Case of Tanzania. In Handbook of Public Health Nutrition: International, National, and Regional Perspectives (pp. 1-25). Cham: Springer Nature Switzerland.
12. Saaka, M., & Galaa, S. Z. (2017). How is dietary diversity related to haematological status of preschool children in Ghana?. *Food & Nutrition Research, 61*(1), 1333389.
13. National Bureau of Statistics NBS. (2022). "National average household size and demographic report". Federal Government of Nigeria.
14. World Health Organization. 2023. "Maternal education and child health outcomes: Global evidence and trends".
15. Fadare, O., Amare, M., Mavrotas, G., Akerele, D., & Ogunniyi, A. (2019). Mother's nutrition-related knowledge and child nutrition outcomes: Empirical evidence from Nigeria. *PloS one, 14*(2), e0212775.
16. Adekanmbi, V. T., Uthman, O. A., & Mudasiru, O. M. (2013). Exploring variations in childhood stunting in Nigeria using league table, control chart and spatial analysis. *BMC public health, 13*(1), 361.
17. National Bureau of Statistics NBS. (2023). Nigeria labor force survey: Informal sector and employment statistics". Federal Government of Nigeria.

18. Food and Agriculture Organization, International Fund for Agricultural Development, United Nations Children's Fund, World Food Programme, & World Health Organization. 2022. "The state of food security and nutrition in the world 2022: Adapting food systems for affordable healthy diets". FAO.
19. Okafor, C. A., Oziegbe, E. O., & Foláyan, M. O. (2025). Dietary diversity and food groups associated with early childhood caries in a suburban community in Nigeria. *BMC Oral Health*.
20. World Health Organization. 2021. "Inadequate fruit and vegetable intake: A global health concern".
21. Osunu, P. T., Moyegbone, J. E., Ofili, C. C., & Nwose, E. U. (2024). Consumption and factors associating the provision of fruits and vegetables to children in Bayelsa state of Nigeria. *International journal of research in medical sciences, 12*(2), 397.
22. Quadri, J. A., Akinremi, T. I., Alagbe, I. C., Edun, B. T., & Osinowo, Y. J. (2025). Dietary Diversity and Anthropometric Indices of Under-Five Children in Rural Nigeria. *European Journal of Nutrition and Food Safety, 17*(9), 12-18.
23. Olumakaiye, M. F. (2013). Dietary diversity as a correlate of undernutrition among school-age children in southwestern Nigeria. *J Child Nutr Manag, 37*(1).
24. Obekpa, H. O., Abu, G. A., & Abu, O. (2020). EFFECT OF DIETARY DIVERSITY ON STUNTING OF CHILDREN IN NIGERIA. *Journal of Agripreneurship and Sustainable Development, 3*(2), 121-127.
25. World Health Organization. (2024). *WHO guideline on the prevention and management of wasting and nutritional oedema (acute malnutrition) in infants and children under 5 years*. World Health Organization.
26. Atoloye, A. T., Samuel, F., Aluko, O. O., Torimiro, N., Bamgbade, B., Areola, A. A., ... & Bersamin, A. (2024). Factors associated with caregivers' food safety knowledge, behavior, perception of food safety control, and the nutrition status of under-5 children in Nigeria. *BMC public health, 24*(1), 2813.
27. Ogayi, C. O., & Chukwuma, O. J. (2025). Beyond Income: Examining the Impact of Multidimensional Poverty on Health Security in Rural Communities of Eastern Nigeria. *Development and Sustainability in Economics and Finance*, 100088.
28. Akombi, B. J., Agho, K. E., Renzaho, A. M., Hall, J. J., & Merom, D. R. (2019). Trends in socioeconomic inequalities in child undernutrition: Evidence from Nigeria Demographic and Health Survey (2003–2013). *PloS one, 14*(2), e0211883.
29. Garenne, M., Thurstans, S., Briend, A., Dolan, C., Khara, T., Myatt, M., ... & Wells, J. C. (2022). Changing sex differences in undernutrition of African children: findings from Demographic and Health Surveys. *Journal of biosocial science, 54*(5), 847-857.
30. World Health Organization. 2021. "Malnutrition".