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Dietary Diversity and Determinants of Nutritional Status of Primary School Children in Anambra State, Nigeria.

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Abstract

Proper nutrition accomplished through consumption of diverse foods is very vital as it provides the foundation for optimum health, strength, cognitive development and academic achievement, especially during the school age.

Aim: this study aimed at assessing dietary diversity and determinants of nutritional status of primary school children in Anambra State, Nigeria.

Materials and methods: a descriptive cross-sectional survey involving primary school children from two selected local government areas (one urban and one rural) of Anambra State was carried out over a 3-month period. A total of 637 participants comprising 297 males and 340 females were selected using multistage sampling technique. Interviewer-administered questionnaires were used to obtain needed information from the pupils and their parents/guardians. Anthropometric parameters such as height and weight were measured using a digital scale and a measuring tape. Nutritional status was determined using the WHO AnthroPlus version 1.0.4 and data was analyzed using SPSS version 25.

Results: Findings revealed that 69.54% of study participants had medium dietary diversity score and the least consumed food groups were animal products (7.2%). The results further showed that 146 pupils (22.92%) had at least one form of malnutrition with the prevalence of wasting, stunting, overweight and obesity being 6.9%, 5.5%, 5.3% and 5.2%, respectively. Findings also suggested that male gender and large family size predicted the likelihood of stunting; while urban residence, attending private school, belonging to high socio-economic class increased the likelihood of overweight and obesity.

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Conclusion: The present study showed that a high percentage of the population had normal nutritional status while only a small proportion was stunted, wasted, overweight or obese. Factors such as place of residence, family size, birth order, type of school, parental educational level and socio-economic status had significant impact on nutritional status.

Keywords: Dietary diversity, stunting, wasting, overweight, obesity, primary school children, nutritional status.

Introduction

Consumption of diverse food sources is vital for healthy growth, functional immune system and a productive life. Food is essential as it provides important nutrients for survival and helps the body function optimally (Black *et al*., 2013; Opoola, *et al.*, 2016). Therefore, consuming different food items over a reference period (dietary diversity), is a critical component of a high-quality diet and a reliable indicator of dietary adequacy among children (Weerasekara, *et al*., 2020; Oka for, *et al.*, 2020; Sié, *et al.*, 2018). The World Health Organization (WHO) recommends a minimum dietary diversity of at least four food groups out of seven to maintain proper child growth and development (Modjadji *et al.*, 2020). However, some parents or caregivers may not understand what constitutes good nutrition and may depend on fast food or convenience foods for meals and snacks which may lead to malnutrition (Mallard *et al*., 2016; Onyeje, 2022). The consequences of malnutrition include poor physical growth and development, weakened immune systems, and greater risk of cancer and diabetes in later life (Keno, *et al.*, 2021; Khamis, *et al.*, 2019; Modjadji, *et al.*, 2020; Sié, *et al.*, 2018).

A child's nutritional status is most widely measured using anthropometric parameters such as height, weight, head circumference, among others (UNICEF, 2013). de Onis and Branca (2016) opined that the first 1000 days of life (conception -23months) is a very important window in a child's life during which rapid physical and mental development occurs and under-nutrition during this critical phase can leave irreversible consequences on the child's growth leading to an increased risk of stunting, wasting, low attention span, poor academic achievement, mortality amongst others.

The primary school age, usually 6-12 years, is an active phase for both physical growth and mental development (Soto and Tackett, 2015); and heralds an important developmental period for accumulating knowledge and learning to understand society (Patsa and Mukherjee, 2021; Sharma, *et al.*, 2017). Consequently, proper nutrition during this period is very vital as it provides the foundation for optimum health, strength, cognitive development and productivity (Kamath *et al.*, 2017).

Nigeria is listed among the most vulnerable populations for under-nutrition which has remained prevalent in developing countries (Akombi, *et al.*, 2017). The 2018 demographic and health surveys done in Nigeria showed that the prevalence of stunting has remained at 37% since 2013 (National Population Commission {NPC, Nigeria} and ICF International, 2019). This finding corroborated with other studies done in Nigeria by Akubuilo *et al*., (2020) and Ayogu *et al.*,

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(2018) which observed high prevalence of stunting (36.8%; 41.6%) and wasting (28.7%; 20.0%), respectively. Similarly, data from a three-decade (1983-2013) review in Nigeria showed a rise from 5 to 12% and 0.0 to 5.8% for overweight and obesity, respectively among children and adolescents (Ejike, 2014). More so, studies have shown that household food insecurity (Wolde, *et al.,* 2015), low maternal education (Soekatri *et al.*, 2020), helminthic infestations (Khanam, *et al.,* 2019), nutritional transition (Gautam, 2016, Lowe *et al.,* 2021), large family size (Hailegebriel, 2020; Keno *et al.*, 2021), Gender and school type **(**Adetunji, *et al.,* 2019; Sathiadas *et al.*,2021) were some of the major factors contributing to malnutrition.

It has been reported that many children, especially those from developing countries, still struggle to have adequate nutrition (Asmare, *et al.,* 2018; Khamis, *et al.,* 2019) as most of the food consumed in developing countries consist of monotonous starchy staples, and often include little or no animal proteins and few fruits and vegetables (Modjadji, *et al.*,2020). As a result, the prevalence of malnutrition may be higher than reported data due to increasing tendency of the populace to consume fast and convenience foods coupled with rising prices of food due to insecurity, climate change, poor agricultural yields and global economic downturns.

Igbokwe *et al.,* (2017) stated that school age children constitute about 23% of the total population in Nigeria. This number is quite significant as malnutrition at this stage will deplete the future workforce of the nation with dire consequences. It is hoped that study findings will achieve the following objectives: to determine dietary diversity of primary school children using a 72-hour dietary recall; determine the prevalence of wasting, stunting, overweight and obesity among primary school children; and ascertain factors affecting their nutritional status.
Three hypotheses guided this study:
Ho_1: There would be no significant association between parents' educational level and the nutritional status of primary school children in Anambra State.

Ho_2: There would be no significant association between parents' employment status and the nutritional status of primary school children in Anambra State.

Ho_3: There would be no significant association between family's average monthly income and the nutritional status of primary school children in Anambra State.

Method

Research Design-Descriptive cross-sectional study
Area of the Study-Anambra State
The population of the study- primary school pupils in rural and urban communities of Anambra state.
Sample size- 650 pupils from selected private and public schools in Anambra State
Sampling Techniques- multistage sampling technique
Stage 1: using a simple random sampling method, Anambra South senatorial district was selected out of the three senatorial zones namely Anambra North, Anambra South and Anambra Central.

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Stage 2: the 21 LGAs in Anambra South were stratified into rural and urban. Simple random sampling method was then used to select two LGAs- one rural (Ekwusigo) and one urban (Nnewi North), and each has four communities.
Stage 3: The four communities in each of the selected LGAs were used in this study:

- Nnewi North LGA: Umudim, Uruagu, Otolo and Nnewichi
- Ekwusigo LGA: Ozubulu, Oraifite, Ichi and Ihembosi

In order to ensure generalizability of the study, the researchers further used a simple random sampling technique to select two primary schools- one public and one private from each of the communities; making a total of 16 schools (8 public and 8 private) used in the study.
Stage 4: proportionate stratified sampling technique was used to determine the number of pupils to be selected from each school and from each class level (primaries 1-6).

Instruments for Data Collection-

i. **Questionnaire:** A structured questionnaire was administered to pupils and parents in order to elicit relevant data required for the study.
ii. **Digital weighing scale:** A digital weighing scale with 180.00kg capacity (OMRON HN283) was used to obtain the weights of the participants.
iii. **Measuring tape**: A non-distensible plastic tape with 150.00cm capacity was used to measure the participants' heights while standing upright against a wall.
iv. **Checklist**: A 72-hour dietary recall checklist of 12 food groups proposed by Food and Agricultural Organization (Kennedy, *et al.,* 2013) was used to elicit dietary diversity score of the pupils. Dietary diversity scores (DDS) was calculated by summing up the points scored on each of the food groups, and classified as low (≤4), medium (5–8) and high (9–12).

Method of Data Collection

Permission to carry out the study was obtained from the State's Basic Education Board. More so, ethical approval was obtained from Ethics Committee, Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State. The researchers also obtained approval letters from the Local Government Education Authorities which were presented to heads of selected primary schools in order to obtain permission to carry out the study. Proper consent was sought from parents/guardians and assent from the pupils. Data was collected over a three month period.

Method of Data Analysis

The data was analyzed using Statistical Package for Social Sciences (SPSS) software version 25 (IBM Corp., Armonk, New York, USA). Anthropometric indices were calculated using the WHO AnthroPlus version 1.0.4 to obtain the nutritional status of school children. Descriptive statistics were used to summarize the socio-demographic data. One-way ANOVA was used to determine the relationships between variables. Both crude and adjusted odds ratios (AORs) with their corresponding 95% CIs were used to determine the strength of association. Alpha significant level was set at 0.05 ($p<0.05$).

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Results

Table 1: Socio-Demographic Characteristics of the Respondents

N= 637

Variables	Options	Freq	Percent (%)
Age (years)	6-9	361	56.67
	10-13	268	42.07
	>13	8	1.26
Sex	Male	297	46.60
	Female	340	53.40
pupil's place of residence	Urban	452	71.00
	Rural	185	29.00
Type of school	Private	393	61.70
	Public	244	38.30
Parent's marital status	Married	587	92.20
	Separated	16	2.50
	Widowed	32	5.00
	Unmarried	2	0.30
Family size	1-3 persons	30	4.70
	4-6 persons	310	48.70
	7 and above	297	46.60
Type of family	Nuclear	426	66.90
	Extended	211	33.10
Mother's HLE	No formal education	31	4.90
	Primary education	152	23.90
	Secondary education	314	49.30
	Tertiary education	137	21.50
	No contribution to welfare	3	0.50
Mother's employment status	Unemployed	48	7.50
	Employed	587	92.2
	Deceased	2	0.30
Father's HLE	No formal education	44	6.90
	Primary education	189	29.70
	Secondary education	283	44.40
	Tertiary education	81	12.70
	No contribution to welfare	40	6.30
Father's employment status	Unemployed	5	0.80
	Employed	602	94.5
	Deceased	30	4.70
Family's ave. monthly income	Less than 30,000	115	18.10

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	30,000-50,000	199	31.20
	50,000-100,000	132	20.70
	More than 100,000	191	30.00
Means of sewage disposal	Pit toilet	75	11.80
	Modified pit toilet	7	1.10
	Water cistern	551	86.50
	Nearby farm/bush	4	0.60
Parent's socioeconomic status	Low	221	34.70
	High	416	65.30

Table 1 shows the socio-demographic characteristics of the pupils indicating that the majority representing 361 (56.67%) were between 6-9 years, 268 (42.07%) falls within 10-13 years while 8 (1.26%) were above 13 years. The mean age of the pupils was 9.22 ±1.98years. Majority were also females (53.4%) while 46.6% were males. Considering the place of residence, a larger number of pupils 452 (71%) lived in urban areas whereas 185 (29%) were rural dwellers. Pupils attending private schools were in the majority (61.7%) compared to those attending public schools (38.3%). The result also revealed that most of the pupils' parents were married (92.2%), while widowed, separated and unmarried parents accounted for 5.0%, 2.5% and 0.3%, respectively. Also, majority of the pupils (95.3%) lived in families with at least four persons (2.42±0.58) compared to a few (4.7%) who came for families with less than four persons. Furthermore, lager number of pupils 426 (66.9%) came from nuclear families in contrast to 211 (33.1%) who were from extended families. The table further revealed that majority of the participant's mothers (95.1%) had some form of education while a few (4.9%) had no formal education. In the same vein, most of the mothers (92.2%) had some form of occupation, only a few (7.5%) were unemployed. Similarly, most of the pupil's fathers had some form of education (86.8%) and occupation (94.5%), while a few received no formal education (6.9%) nor had any occupation (0.8%). More so, considering the family's average monthly income, 31.2% of the families earned 30,000-50,000 naira, 30.0% above 100,000 naira, 20.7%, 50,000-100,000 naira, while 18.1% earned less than 30,000 naira. Majority (86.5%) used water cistern as means of sewage disposal. It was also observed that a larger number of the pupils (65.3%) were from high socioeconomic class compared to 34.7% who were from low class.

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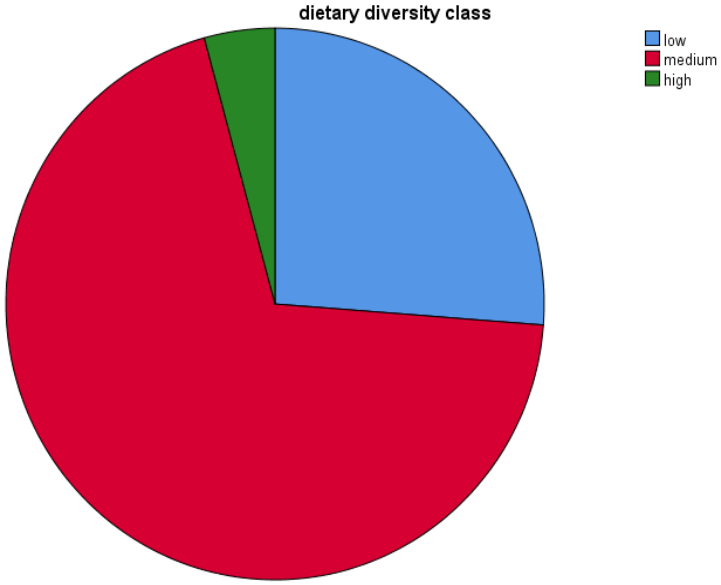
Objective 1: Determine the dietary diversity of primary school children using a 72-hour dietary recall

Figure 1: Dietary diversity of primary school children



From the chart above, it can be deduced that most of the pupils 443 (69.54%) had medium dietary diversity score, 167 (26.2%) low while a few 27 (4.26%) high dietary diversity score.

Table 2: Prevalence of wasting, stunting, overweight and obesity among primary school children

N=637

Classification	Options	Frequency	Percentage (%)
BMI z-score grade	Normal	358	56.20
	Borderline	168	26.40
	Underweight/wasting	44	6.90
	Overweight	34	5.30
	Obese	33	5.20
Height for age z-score grade	Normal	495	77.70
	Borderline	107	16.80
	Stunted	35	5.50

Table 4.2 shows that majority of the pupils have normal BMI (56.2%) and height (77.7%). However, findings revealed that the prevalence of wasting, stunting, overweight and obesity were 6.9%, 5.5%, 5.3% and 5.2%, respectively.

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Objective 3: Factors affecting nutritional status of primary school children.

Table 3a: Binary Logistic Regression Analysis of Factors Associated with Stunting in Primary School Children in Anambra State

Covariates	Category	Percent (%)	COR (95%CI)	AOR (95% CI)	P value
Age			1.36 (1.14-1.63)	1.36 (1.15-1.62)	0.01**
Sex	Male	46.60	1.22(0.62-2.42)	1.08 (0.52-2.27)	0.832
	Female	53.40	1	1	
Family size	1-3persons	4.70	1.17 (0.26-5.36)	1.07 (0.21-5.48)	0.937
	4-6persons	48.70	0.90 (0.44-1.81)	1.29 (0.60-2.80)	0.512
	7 and above	46.60	1	1	
Place of residence	Urban	71.00	0.41 (0.21-0.81)	0.42 (0.19-0.93)	0.032**
	Rural	29.00	1	1	
Type of school	Private	61.70	0.07 (0.03-0.20)	0.08 (0.03-0.26)	0.000**
	Public	38.30	1	1	
Type of family	Nuclear	66.90	1.25 (0.59-2.66)	0.91 (0.29-2.83)	0.868
	Extended	33.10	1	1	
Sewage disposal	Pit toilet	11.77	1	1	
	Modified pit	1.09	0.00	0.00	0.999
	Water cistern	86.49	0.75 (0.28-2.01)	2.23 (0.76-6.56)	0.145
	Bush/farm	0.65	14.00(1.62-121.37)	10.51(1.07-103.59)	0.044**
Socioeconomic class	High	65.31	0.33 (0.17-0.67)	0.96 (0.42-2.20)	0.920
	Low	34.69	1	1	
Dietary diversity score	-	-	0.70 (0.55-0.91)	0.82 (0.60-1.12)	0.209

In the multivariable logistic regression analysis shown in **table 3a**, the likelihood of stunting was significantly less among children who lived in urban areas (AOR = 0.42, 95% CI: 0.19–0.93, p=0.032); and those who attended private schools (AOR=0.08, 95% CI: 0.03-0.26, p=0.000). However, children whose means of sewage disposal was bush/farm had higher likelihood of stunting (AOR = 10.51, 95% CI: 1.07– 103.59, p=0.044) compared to those who used pit toilet. Increasing age was also a significant contributor to likelihood of stunting (AOR = 1.36, 95% CI: 1.15– 1.62, p=0.01). Other factors related to increased odds of stunting include male gender (AOR = 1.08, 95% CI: 0.52– 2.27, p=0.832) and larger family size (AOR = 1.29, 95% CI: 0.60–2.80, p=0.512). On the contrary, children who were from nuclear families (AOR = 0.91, 95% CI: 0.29– 2.83, p=0.868); those who came from high socioeconomic background (AOR = 0.96, 95%

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CI: 0.42– 2.20, p=0.920), and pupils with higher dietary diversity scores (AOR = 0.82, 95% CI: 0.60– 1.12, p=0.209), were less likely to be stunted.

Table 3b: Multinomial Logistic Regression Analysis of Factors Associated with Wasting in Primary School Children

Covariates	Category	Percent (%)	COR (95%CI)	AOR (95% CI)	P value
Age	-	-	1.18 (1.01-1.38)	1.08 (0.92-1.28)	0.356
Sex	Male	46.60	1.37 (0.74-2.53)	1.37 (0.72-2.59)	0.341
	Female	53.40	1.00	1.00	
Family size	1-3persons	4.70	0.65 (0.15-2.87)	0.40 (0.08-1.93)	0.253
	4-6persons	48.70	0.39 (0.20-0.77)	0.37 (0.18-0.76)	0.007**
	7 and above	46.60	1.00	1.00	
Place of residence	Urban	71.00	0.57 (0.31-1.07)	0.62 (0.30-1.26)	0.182
	Rural	29.00	1.00	1.00	
Type of school	Private	61.70	0.42 (0.22-0.78)	0.50 (0.24-1.05)	0.068
	Public	38.30	1.00	1.00	
Type of family	Nuclear	66.90	0.94 (0.49-1.80)	0.52 (0.21-1.27)	0.150
	Extended	33.10	1.00	1.00	
Socioeconomic class	High	65.31	0.85 (0.46-1.59)	1.98 (0.92-4.29)	0.082
	Low	34.69	1.00	1.00	
Dietary diversity score	-	-	0.74 (0.58-0.93)	0.77(0.60-0.99)	0.049**

In the multivariable logistic regression displayed in **table 3b** above, it can be deduced that the likelihood of being wasted was significantly lower with larger family size (AOR = 0.37, 95% CI: 0.18– 0.76, p=0.007). Other factors associated with reduced odds of being wasted were urban residence (AOR = 0.62, 95% CI: 0.30– 1.26, p=0.182); attending private school (AOR = 0.50, 95% CI: 0.24– 1.05, p=0.068); and coming from a nuclear family (AOR = 0.52, 95% CI: 0.21– 1.27, p=0.150). In contrast, increasing age (AOR = 1.08, 95% CI: 0.92–1.28, p=0.356); male gender (AOR = 1.37, 95% CI: 0.72– 2.59, p=0.341); and curiously, higher socioeconomic class (AOR = 1.98, 95% CI: 0.92– 4.29, p=0.082) were associated with more likelihood of being wasted.

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Table 3c: Multinomial Logistic Regression Analysis of Factors Associated with Overweight in Primary School Children in Anambra State

Covariates	Category	Percent (%)	COR (95%CI)	AOR (95% CI)	P value
Age			1.08 (0.91-1.29)	1.17 (0.95-1.44)	0.132
Sex	Male	46.60	0.54 (0.26-1.14)	0.57 (0.27-1.23)	0.150
	Female	53.40	1.00	1.00	
Family size	1-3persons	4.70	1.04 (0.23-4.75)	0.74 (0.14-3.85)	0.718
	4-6persons	48.70	0.68 (0.33-1.40)	0.59 (0.27-1.30)	0.191
	7 and above	46.60	1.00	1.00	
Place of residence	Urban	71.00	2.02 (0.82-4.98)	1.46 (0.51-4.18)	0.484
	Rural	29.00	1.00	1.00	
Type of school	Private	61.70	3.82 (1.46-10.04)	3.43 (1.10-10.73)	0.034**
	Public	38.30	1.00	1.00	
Type of family	Nuclear	66.90	0.79 (0.38-1.61)	0.98 (0.41-2.33)	0.958
	Extended	33.10	1.00	1.00	
Socioeconomic class	High	65.31	4.42 (1.53-12.73)	2.57 (0.73-9.09)	0.143
	Low	34.69	1.00	1.00	
Dietary diversity score	-	-	1.28 (1.03-2.77)	1.14 (0.90-1.44)	0.283

From the multivariate logistic regression presented in the table above, children who attended private schools (AOR = 3.43, 95% CI: 1.10–10.73, p=0.034); increasing age (AOR = 1.17, 95% CI: 0.95–1.44, p=0.132); urban dwelling (AOR = 1.46, 95% CI: 0.51–4.18, p=0.484); belonging to high socioeconomic class (AOR = 2.57, 95% CI: 0.73–9.09, p=0.143) and having higher dietary diversity scores (AOR = 1.14, 95% CI: 0.90–1.44, p=0.283) were associated with higher odds of overweight. This is in contradistinction to male gender (AOR = 0.57, 95% CI: 0.27–1.23, p=0.150); larger family size (AOR = 0.59, 95% CI: 0.27–1.30, p=0.191); and belonging to nuclear family (AOR = 0.98, 95% CI: 0.41–2.33, p=0.958), which were associated with reduced odds.

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Table 3d: Multinomial Logistic Regression Analysis of Factors Associated with Obesity in Primary School Children

Covariates	Category	Percent (%)	COR (95%CI)	AOR (95% CI)	P value
Age	-	-	0.83 (0.69-1.00)	0.88 (0.70-1.10)	0.259
Sex	Male	46.60	1.07 (0.53-2.17)	1.24 (0.58-2.27)	0.582
	Female	53.40	1.00	1.00	
Family size	1-3persons	4.70	0.59 (0.07-4.60)	2.59 (0.27-25.17)	0.412
	4-6persons	48.70	0.88 (0.43-1.79)	0.88 (0.38-2.05)	0.766
	7 and above	46.60	1.00	1.00	
Place of residence	Urban	71.00	13.86 (1.88-102.34)	8.83 (1.08-72.58)	0.043**
	Rural	29.00	1.00	1.00	
Type of school	Private	61.70	6.59 (1.99-21.88)	3.30 (0.76-14.39)	0.113
	Public	38.30	1.00	1.00	
Type of family	Nuclear	66.90	0.97 (0.46-2.05)	1.86 (0.76-4.54)	0.175
	Extended	33.10	1.00	1.00	
Socioeconomic class	High	65.31	4.27 (1.48-12.33)	3.46(1.15-10.41)	0.028**
	Low	34.69	1.00	1.00	
Dietary diversity score			1.83 (1.48-2.27)	1.67 (1.33-2.10)	0.000**

In **table 3d**, the likelihood of being obese was higher in children who lived in urban areas (AOR = 8.83, 95% CI: 1.08–72.58, p=0.043); those from high socioeconomic class (AOR = 3.46, 95% CI: 1.15–10.41, p=0.028) and pupils who had higher dietary diversity scores (AOR = 1.67, 95% CI: 1.33–2.10, p=0.000). Additionally, male gender (AOR = 1.24, 95% CI: 0.58–2.27, p=0.582); small family size (AOR = 2.59, 95% CI: 0.27–25.17, p=0.412); attending private schools (AOR = 3.30, 95% CI: 0.76–14.39, p=0.113); and belonging to a nuclear family (AOR = 1.86, 95% CI: 0.76–4.54, p=0.175), were all associated with higher odds of obesity. However, obesity was less likely with increasing age (AOR = 0.88, 95% CI: 0.70–1.10, p=0.259) and larger family size (AOR = 0.88, 95% CI: 0.38–2.05, p=0.766).

Research Hypotheses: Association between nutritional status and tested variables
Table 4

Variables	Test statistic	P-value
Parent's educational level	Oneway ANOVA	0.000**
Parent's employment status	Oneway ANOVA	0.000**
Family's average monthly income	Oneway ANOVA	0.000**

** Statistically significant p<0.05

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Discussion

Dietary diversity of primary school children in Anambra State

Result showed that most of the pupils 443 (69.54%) had medium dietary diversity score, 167 (26.2%) low while a few 27 (4.26%) high dietary diversity score. It was also observed that foods from animal sources such as egg, milk/milk products and meat were infrequently consumed (7.2%) while starchy staples such as rice, yam, garri and cassava were more commonly (63.6%) eaten by the pupils. It can also be deduced that most of the pupils consumed between five to eight food groups out twelve. This observation seems commendable and may explain the relatively low prevalence of under-nutrition in this study. This result is in line with findings of Oka for *et al.,* (2020) who observed that majority (55.9%) of school children in a rural community in Nsukka, Enugu State Nigeria had medium dietary diversity. In contrast, Ukegbu, and Ogu, (2017) found that majority (73.5%) of children in rural communities of Imo State, Nigeria, had low dietary diversity scores. This disparity in result finding may be attributed to difference in the study areas as their study focused only on children in the rural community.

Prevalence of wasting, stunting, overweight and obesity among primary school children

Findings from this study showed a 22.92% cumulative prevalence of malnutrition. The prevalence of wasting, stunting, overweight and obesity were 6.9%, 5.5%, 5.3% and 5.2%, respectively. The prevalence of the different forms of malnutrition is low in this study. However, an overall prevalence of 22.92% implies that various forms of malnutrition still exist among primary school children in Anambra State which may be due to factors such as poor access to adequate nutrition at home and/or at school resulting from improper implementation of the school feeding programme. This result is in tandem with the findings of Umeokonkwo *et al.*, (2020), who found a low prevalence of 7.2%, 9.9%, 1.4% and 0.7% for wasting, stunting, overweight and obesity, respectively, giving an overall prevalence of malnutrition of 17.8% among primary school children in Abakaliki metropolis, Ebonyi State, Nigeria. A similar study by Akubuilo *et al.* (2020) reported a prevalence of 3.6%, 2.1%, 6.7% and 4.2% for wasting, stunting, overweight and obesity, respectively, among primary school children in Enugu-East local government area, Enugu State. However, Ayogu *et al.*, (2018) in a study done in a rural community in Enugu State, reported a higher prevalence of wasting (20.0%) and stunting (41.6%), which may be due to the low socioeconomic status prevalent in the community. Also, Uzosike *et al.*, (2020) observed a high frequency of stunting, underweight and overweight among pupils in Rivers State as 39.4%, 23.0% and 6.0% respectively. A higher prevalence of stunting was also reported by Patsa and Mukherjee (2021) and Tariku *et al.* (2018), 17.1% and (41.9%), respectively, among primary school children. Another study by Sathiadas *et al.*, (2021) in Northern Sri Lanka, found a prevalence of 11.0% and 6.3% of overweight and obesity among school children, respectively

Factors affecting nutritional status of primary school children in Anambra State

After adjusting for cofounders, results from this study indicated that increasing age (AOR = 1.36, 95% CI: 1.15– 1.62, p=0.01); male gender (AOR = 1.08, 95% CI: 0.52– 2.27, p=0.832) and larger family size (AOR = 1.29, 95% CI: 0.60– 2.80, p=0.512), strongly predicted the likelihood

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of stunting among primary school children in Anambra State. This infers that the aforementioned factors contribute to stunting as such children may have limited access to good nutrition. Whereas, children who lived in urban areas (AOR = 0.42, 95% CI: 0.19–0.93, p=0.032); attended private schools (AOR=0.08, 95% CI: 0.03-0.26, p=0.000); and who came from high socioeconomic background (AOR = 0.96, 95% CI: 0.42– 2.20, p=0.920), had lesser odds of being stunted. This result agrees with the findings of Abdel Wahed *et al.* (2017), Ieiri *et al.* (2021), Igbokwe *et al.*, (2017), Tariku *et al.* (2018), Umeokonkwo *et al.*, (2020) and Vilcins *et al.*,(2018), who reported that stunting was higher with increasing age, low socioeconomic status, pupils from larger families, those attending public schools and males. However, Ayogu *et al.*, (2018) found that male gender was associated with reduced odds of being stunted.
Also, from the analysis, large family size (AOR = 0.37, 95% CI: 0.18– 0.76, p=0.007); urban residence (AOR = 0.62, 95% CI: 0.30– 1.26, p=0.182); attending private school (AOR = 0.50, 95% CI: 0.24– 1.05, p=0.068) and having a nuclear family background (AOR = 0.52, 95% CI: 0.21– 1.27, p=0.150), were associated with reduced odds of wasting in primary school children. In contrast, increasing age (AOR = 1.08, 95% CI: 0.92–1.28, p=0.356); male gender (AOR = 1.37, 95% CI: 0.72– 2.59, p=0.341); and curiously, higher socioeconomic class (AOR = 1.98, 95% CI: 0.92– 4.29, p=0.082) predicted greater odds of being wasted. This discovery is in tandem with the findings of Hailegebriel (2020) who revealed in his study that the risk of wasting was increased with male sex and age >10 years. Igbokwe *et al.*, (2017) also stated that low socioeconomic status is associated with wasting in school children.

Furthermore, the likelihood of overweight and obesity was higher among pupils attending private schools (AOR = 3.43, 95% CI: 1.10–10.73, p=0.034); increasing age (AOR = 1.17, 95% CI: 0.95–1.44, p=0.132); those living in urban area (AOR = 1.46, 95% CI: 0.51–4.18, p=0.484), and belonging to high socioeconomic class (AOR = 2.57, 95% CI: 0.73–9.09, p=0.143). This may be because pupils from wealthy families have greater access to calorie dense foods and drinks resulting to energy surplus in them. More so, male gender (AOR = 1.24, 95% CI: 0.58–2.27, p=0.582) was associated with higher likelihood of obesity. This result reinforces the finding of Adetunji *et al.* (2019) that overweight and obesity was significantly associated with attending private schools and higher socioeconomic status. He however reported that female gender was significantly associated with obesity which contradicts the research finding.

Further analysis showed that parent's educational level and employment status, average family's monthly income are significantly associated with the nutritional status of primary school children ($p<0.001$). This suggests that pupils whose parents had better education and occupation had better nutrition outcomes. This observation concurs with that made by Adedokun and Yaya (2021); Ayogu *et al.*, (2018); Sathiadas *et al.*, (2021); Soekatri *et al.*, (2020); and Wolde *et al.*, (2015) who stated that household income and parents education level significantly impact a child's nutritional status.

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Conclusion

The research study examined the dietary diversity and determinants of nutritional status of primary school children in Anambra State, Nigeria. Based on the findings of the study, the following conclusions were drawn:

- Majority of the participants had medium dietary diversity and consumed mostly starchy staples
- Prevalence of various forms of malnutrition was low which was a consequence of consuming diverse food by most of the pupils
- Determinants of nutritional status in school children include place of residence, type of school, parent's education and employment status, size of household and family's average monthly income

Implications of the study

- This study will increase the awareness of relevant stakeholders such as ministry of education, ministry of health, policy-makers and healthcare, to determinants of nutritional status of school children in Anambra State and will guide them in formulating nutrition-friendly policies that will further reduce the menace of malnutrition.
- Results showed that factors such as parents with good education and occupation, high average monthly income and consumption of varieties of foods by family members, protect against under-nutrition. It is therefore imperative, that multiple measures to empower families be adopted to improve family's income in addition to providing nutrition education to teachers and parents as these measures will have far reaching positive effects on the nutritional status of school children.
- Furthermore, since finding suggests that pupils in private schools had better nutritional status than their counterparts in public schools, resuscitating the now moribund Federal government school feeding programme and making it domicile within the State's administrative powers will go a long way to improving the nutrition of pupils in public schools.

Limitation of the Study

Dietary diversity scores could have been under or over estimated, since it is dependent on ability to recall accurately.

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