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Evaluation of Dietary Diversity, Nutrient Adequacy and Nutritional Status of Pre-school Children in Three Local Government Areas of Ibadan, Nigeria

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Abstract: Malnutrition remains a public health challenge in Nigeria, partly due to poor diversity of diets. Pre-school children are among the vulnerable groups who are mostly affected in communities, as their nutritional status is largely influenced by the quality of diets they consume. Most studies aimed at malnutrition among under-five children have been focused on meeting protein-energy needs without much consideration for micronutrients needs. Dietary diversity has been advocated as a means of meeting nutritional requirements of children. This study was designed to assess the dietary diversity in relation to nutrient adequacy and nutritional status of pre-school children in Ibadan. The descriptive cross-sectional study was carried out among 552 pre-schoolers aged 3-5 years in Egbeda, Ona-Ara and Ido Three Local Government Areas (LGAs) of Ibadan metropolis. A structured questionnaire was used to obtain information on socio-demographic characteristics of mother and child. Nutritional status was determined using anthropometric indices. Food frequency questionnaire of 9 food groups was used to obtain dietary diversity scores (DDS) classified as low (< 4 food groups), average (4 to 6 food groups), and high (≥ 7 food groups); and 24-hour dietary recall was used to obtain nutrient adequacy of diet. Data were analysed using descriptive statistics, Pearson's correlation coefficient, and level of significance set at $p < 0.05$. Malnutrition among pre-schoolers was more prevalent among males (22.0%) than females (18.4%). Stunting was the most prevalent form of malnutrition (26.8%). The DDS of pre-schoolers was low (3.2 ± 1.9). The most consumed food group was cereals, roots and tubers (83.9%) while fruit was least consumed (6.5%). Nutrient adequacy ratio for carbohydrate was highest (1.2 ± 0.2) and least in fibre (0.2 ± 0.2), while mean adequacy ratio for food consumed was (0.72 ± 0.13). There was weak relationship between DDS and nutritional status—wasting (r = -0.067), stunting (r = -0.002) and underweight (r = -0.056). Low dietary diversity and malnutrition existed among pre-school children in the three LGAs. Nutrition education and enlightenment programmes are required by the parents/guardians of pre-school children on importance of dietary diversity in these areas.

Key words: Dietary diversity, pre-school children, nutrient adequacy, nutritional status.

1. Introduction

Adequate nutrition has proved to be a critical factor that contributes to healthy growth and development during childhood stage. In developing countries, growth deficits are caused by inadequate food intake and infections [1], and children are mostly vulnerable to malnutrition, micronutrient deficiency diseases and other nutrition-related diseases such as stunting, wasting and underweight. Pre-school children constitute the most vulnerable group of any community, and their nutritional status is a sensitive indicator of community health and nutrition [2]. Sub-Saharan Africa has been reported to account for one-third of all undernourished children globally, with about 39% stunted, 10% wasted and 25% underweight children under-five years of age [3].

It is estimated that malnutrition underlies more than half of all infants and children mortality [4, 5]. Child's nutritional status not only affects physical growth and maturation; it also influences a number of factors that are central to his or her future educational achievement [6]. The diversity in diets has been identified as the important component of dietary

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quality, and consumption of a higher number of food items and food groups is associated with improved nutritional adequacy of the diet [7, 8]. Varieties of foods are essential to provide the many micronutrients needed by individuals. Poor diversified diet has been reported to be a major cause of under nutrition [9, 10], which is not only known to have negative consequences on individual's health, well-being and development through reduction in physical work capacities and resistance to infection, but also impair cognitive development, reproduction and physical growth [11, 12].

In most sub-Sahara African countries, diets of pre-school children are predominantly based on starchy foods with little or no animal products, and few fresh fruits and vegetables [12]. Most of these plant-based diets tend to be low in a number of micronutrients, and the micronutrients they contain are often in a form that is not easily absorbed [13]. The outcome of this low consumption of adequate nutrients or poor diversified diet is a major cause of malnutrition whose effects on human performance, health and survival have been the subject of extensive research for several decades [12].

Malnutrition among young children in Nigeria still increases with age [14, 15]. Reports from the Nigeria Demographic and Health Surveys (NDHS) of 2013 and 2018 have not shown significant improvement in nutritional status of under-five children. In 2013, the NDHS report indicated that about 37% of Nigerian children were stunted, 18% wasted and 29% underweight; and under-five mortality rate was 128/1,000 live births [14]. In 2018 however, 37% of children under-five were stunted and 19% severely stunted, 7% were wasted with 2% being severely wasted; and 23% were underweight, with 8% being severely underweight. Two percent of children under-five were also reportedly overweight, while under-5 mortality rate increased from 128 to 132/1,000 live births [15], translating to about one in every seven children born in Nigeria dying before their fifth birthday.

Reports have also shown that nutrient density of most diets given to young children is often insufficient to meet their nutrient requirements, therefore increasing the diversity of foods provided to young children, particularly meat, poultry, fish, eggs, fruits and vegetables, is recommended to improve micronutrient intake of children [16]. Pre-school children are generally susceptible to various nutritional deficiencies which have been attributed to their high nutrient requirements for growth and susceptibility to infectious diseases which can inhibit nutrient absorption as well as decrease appetite [12, 17].

Several studies [12, 18-20] have been carried out to assess the dietary diversity and nutritional status of pre-school children in other countries. However, in Nigeria, little information is available on the dietary diversity of pre-school children aged three to five years in relation to their nutritional status and well-being. This study was therefore undertaken to determine the dietary diversity, nutrient adequacy and nutritional status of pre-school children in three Local Government Areas (LGAs) of Ibadan, Oyo state, Nigeria.

2. Methodology

The study was descriptive cross-sectional in design. Three LGAs namely Egbeda, Ido and Ona-ara from Ibadan metropolis, Oyo State, Nigeria were selected from the list of six peri-urban LGAs in Ibadan through balloting. Systematic random sampling technique was used to select four wards from each of the three LGAs, and from each ward any household having a child or children aged 3-5 years was listed. A total of 552 children were recruited for the study.

A pre-tested, interviewer-administered questionnaire containing demographic and socio-economic characteristics, health status, food frequency, and 24-hour dietary recall was used to collect information from the respondents (mothers or caregivers of the children served as proxy). Anthropometric indices (height and weight) of recruited children were also

taken. The nutrient adequacy was evaluated through dietary diversity score (DDS) in which foods were classified into nine groups in accordance with FAO [21]. Measure of DDS was based on simple counting of number of food groups consumed in the past 24 hours, and classified as low (< 4 food groups), average (4 to 6 food groups), and high (≥ 7 food groups).

Data on children's weight and height were analysed using WHO Anthro and result interpreted using WHO growth standard with the cut off value of below -2 SD or -3 SD. Data from 24-hour dietary recall of food consumed were interpreted into nutrients using the Total Diet Analysis (TDA) software. Nutrient adequacy was estimated using the nutrient adequacy ratio (NAR) for the micronutrients (vitamins A, B6, C, riboflavin, iron and zinc), energy and protein. Adequacy of the overall diet was estimated using mean adequacy ratio (MAR, %) using the equations:

$$\text{NAR} = \frac{\text{Intake of a nutrient}}{\text{Recommended Nutrient Intake (RNI) by WHO/FAO}}$$

$$\text{MAR},\% = \Sigma \frac{\text{All nutrients} \times 100}{\text{Number of nutrients (excluding protein and energy)}}$$

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of Oyo State Ministry of Health, Ibadan, Nigeria. Descriptive statistics and correlation were used to interpret the results, and the level of significance set at $p < 0.05$.

3. Results

Table 1 shows the socio-demographic characteristics of mothers of children who participated in the study. Mothers/caregivers' age ranged from 15 to 65 years. About half (47.1%) of the participants were between the ages 15 and 30 years, 37.0% between 31-40 years, 13.9% were between 41-50 years while 1.3% were between 51-60 years. More than half (54.7%) of mothers/caregivers were Christians while 45.1% were Muslims. Most (94.9%) of mothers/caregivers were Yoruba and married, 88.1% had between one and four children. Over one-third (35.5%) of the children were 3 years, 30.3% were four years, 34.2% were five years old (Fig. 1); while 52.9% were males (Fig. 2).

About a quarter (25.7%) of the mothers had tertiary education, 49.1% had secondary level of education while 1.3% had no formal education (Table 2). More than half (58.5%) of the mothers/caregivers were traders, 22.1% were self-employed, 5.0% were professionals and 4.5% civil servants. The income level of the mothers/caregivers ranged between ten thousand naira (₦10,000) and > ₦300,000/annum. One-third (33.5%) of the mothers/caregivers reportedly earned above ₦300,000/annum, while 9.8% earned between ₦10,000 and ₦50,000/annum.

In Table 3, majority (88.3%: 46.3% male, 42.0% female) of the children had normal body mass index (BMI), 9.8% were moderately wasted while 1.9% were severely wasted (WHZ < -3). In terms of stunting, 46.7% had normal height for age, 41.7% (20.8% male, 20.9% female) were moderately stunted ($p > 0.05$), while 11.6% (6.3% males, 5.3% females) were severely stunted. For underweight, 73.4% (38.4% male, 35.0% female) had normal weight for age, 24.2% (13.1% male, 11.1% female) were moderately underweight while 2.4% (1.8 male, 0.6% female) were severely underweight.

There was no significant relationship between maternal age, occupation, income level, and child wasting ($p < 0.05$). However, a significant association existed between level of education, parity of mothers and wasting in the children ($p < 0.05$) (Table 4). There was no significant association between maternal age, educational level, occupation, income, as well as parity of mothers and child stunting ($p < 0.05$) (Table 5).

There was a significant association ($p < 0.05$) between the parity of mothers and child underweight,

Table 1 Demographic characteristics of children's mothers/caregivers.

	Frequency	Percentage
Age of mother/caregiver		
19-30 years	260	47.1
31-40 years	204	37.0
41-50 years	77	13.9
51-60 years	7	1.3
61-65 years	4	0.7
Total	552	100
Religion		
Christianity	302	54.7
Islam	249	45.1
Traditional	1	0.2
Total	552	100
Tribe		
Igbo	18	3.3
Hausa	4	0.7
Yoruba	524	94.9
Others	6	1.1
Total	552	100
Current marital status		
Single	19	3.4
Married	523	94.9
Divorced	1	0.2
Separated	5	0.9
Widowed	2	0.4
Others	1	0.2
Total	552	100
Number of children		
1-4	483	88.1
5-8	64	11.7
9-12	1	0.2
Total	552	100

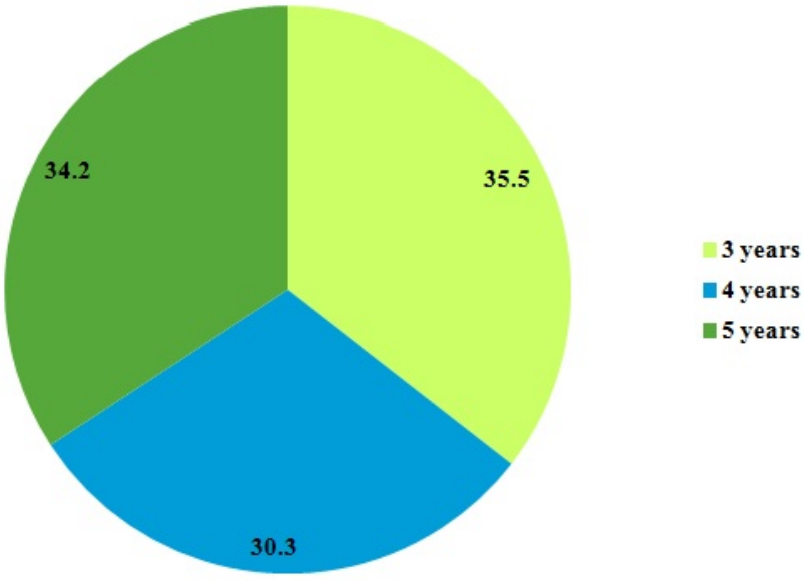

Fig. 1 Age distribution of children.

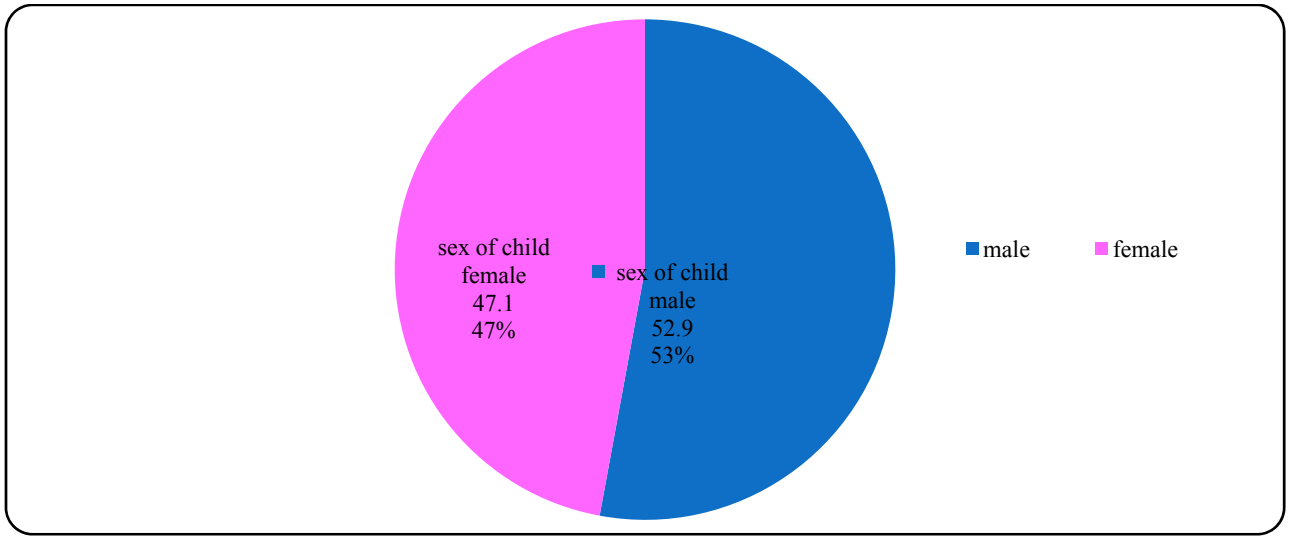

Fig. 2 Distribution of children by gender.

Table 2 Socio-economic characteristics of mothers/caregivers.

	Frequency	Percentage
Level of education		
None	7	1.3
Primary	132	23.9
Secondary	271	49.1
Tertiary	142	25.7
Total	552	100
Occupation		
Unemployed	6	1.1
Employed	546	98.8
Total	552	100
Income per annum		
₦10,000-₦50,000	54	9.8
₦51,000-₦100,000	85	15.4
₦101,000-₦150,000	59	10.7
₦151,000-₦200,000	73	13.2
₦251,000-₦300,000	96	17.4
> ₦300,000	185	33.5
Total	552	100

Table 3 Percent of wasting, stunting and underweight among under-5 children.

	Male		Female		Total	
	No.	%	No.	%	No.	%
Wasting						
Normal (> -1)	249	46.3	226	42.0	495	88.3
Moderate (< -2)	29	4.7	24	3.7	53	9.8
Severe (< -3)	6	1.1	4	0.8	10	1.9
Stunting						
Normal (> -1)	133	25.3	112	21.3	245	46.7
Moderate (< -2)	109	20.8	110	20.9	219	41.7
Severe (< -3)	33	6.3	28	5.3	61	11.6
Underweight						
Normal (> -1)	196	38.4	179	35.0	375	73.4
Moderate (< -2)	67	13.1	57	11.1	124	24.2
Severe (< -3)	9	1.8	3	0.6	12	2.4

Table 4 Association between mothers/caregivers socio-economic characteristics and child wasting.

	Normal No. (%)	Mild No. (%)	Moderate No. (%)	Severe No. (%)	χ^{2*}	*p*-value
Maternal age						
19-30	223 (41.4)		17 (1.5)	4 (0.7)		
31-40	177 (32.9)	17 (3.2)	1 (0.2)	3 (0.6)		
41-50	64 (11.9)	18 (3.3)	4 (0.7)	3 (0.6)	10.724	0.553
51-60	7 (1.3)	5 (0.9)	-	-		
61-65	4 (0.7)		-	-		
Level of education						
None	4 (0.7)	1 (0.2)	2 (0.4)	-		
Primary	115 (21.4)	11 (2.0)	1 (0.2)	2 (0.4)		
Secondary	235 (43.7)	16 (3.0)	4 (0.7)	8 (1.5)	31.366	0.000
Tertiary	121 (22.5)	12 (2.2)	6 (1.1)	-		
Occupation						
Unemployed	6 (1.1)		-	-		
Employed	499 (87.2)		40 (7.6)	13 (2.4)	24.453	0.058
Income						
₦10,000-₦50,000	48 (8.9)	3 (0.6)	1 (0.2)	-		
₦51,000-₦100,000	77 (14.3)	5 (0.9)	1 (0.2)	2 (0.4)		
₦101,000-₦150,000	54 (10.0)	3 (0.6)	2 (0.4)	-		
₦151,000-₦200,000	65 (12.1)	4 (0.7)	3 (0.6)	1 (0.2)		
₦251,000-₦300,000	78 (14.5)	9 (1.7)	1 (0.2)	1 (0.2)	10.136	0.811
> ₦300,000	153 (32.2)	16 (4.0)	5 (0.9)	6 (1.1)		
Number of children						
1-4	4.3 (77.2)	39 (7.3)	11 (2.1)	8 (1.5)		
5-8	59 (11.0)	1 (0.2)	1 (0.2)	1 (0.2)	56.316	0.000
9-12	-	-	-	1 (0.2)		

* χ^2 = symbol for Chi square test.

while there was no significant difference between maternal age, educational level, occupation, income of the mothers and child underweight ($p > 0.05$) (Table 6). Based on the mean values of nutrient intakes, the children met 192% carbohydrate, 115% protein, 91% vitamin B1, 78% vitamin A, 71% zinc, 71% iron, 51% vitamin C and 69% vitamin B6 of their daily requirements (Table 7).

The mean nutrient adequacy ratio (NAR) of the foods consumed by the children for carbohydrate was above 1 while protein, fat, vitamins A, B1 and zinc were closer to 1 (Table 8). Food groups such as cereals, roots and tubers (83.9%); meat, poultry and fish (60.5%); and legumes and nuts (55.7%) were highly consumed by most of the children, while fruits (6.5%) and eggs (15.9%) were least consumed (Table 9). About half (51.3%) of the children consumed food items from less than 4 food groups, 46.7% consumed food items from 4-6 food groups, while only 1.9% consumed food items from 7 or more food groups in the preceding 24 hours of the survey (Table 10).

There was no relationship between NAR of carbohydrate, protein, vitamin B1, vitamin C, vitamin B6 and dietary diversity score of the food consumed by the children. However, there was a weak relationship between the NAR of iron, fibre, vitamin A and dietary diversity score, while no relationship existed between NAR of zinc and dietary diversity score (Table 11). A weak negative relationship existed between wasting, stunting, underweight in children and the dietary diversity score of the food consumed (Table 12).

4. Discussion

More than half of the children participants were male. This is in line with the sample selection from similar studies on under-five children in Nigeria [2, 22]. The overall nutritional status of the under-five children in this present study reflects a high prevalence of stunting (53.3%: 41.7% moderate, 11.6% severe)

Table 5 Stunting distribution based on socio-economic characteristic of mothers/caregivers.

	Normal No. (%)	Mild No. (%)	Moderate No. (%)	Severe No. (%)	χ^{2*}	*p*-value
Maternal age						
19-30	11 (21.1)	71 (13.5)	38 (7.2)	25 (4.8)		
31-40	97 (18.5)	46 (8.8)	37 (5.1)	25 (4.8)		
41-50	31 (5.9)	20 (3.8)	13 (2.5)	11 (2.1)	16.923	0.863
51-60	4 (0.8)	2 (0.4)	1 (0.2)	-		
61-65	2 (0.4)	-	1 (0.2)	-		
Level of education						
None	2 (0.4)	3 (0.6)	2 (0.4)	-		
Primary	62 (11.8)	30 (5.7)	25 (4.8)	9 (1.7)	11.026	0.274
Secondary	124 (23.6)	70 (13.3)	29 (5.5)	32 (6.1)		
Tertiary	57 (10.9)	36 (6.9)	24 (4.6)	20 (3.8)		
Occupation						
Unemployed	3 (0.6)	1 (0.2)	-	1 (0.2)		
Employed	242 (46.2)	138 (26.3)	80 (15.3)	60 (11.5)	14.451	0.492
Income						
₦10,000-₦50,000	29 (5.5)	11 (2.1)	9 (1.7)	4 (0.8)		
₦51,000-₦100,000	30 (5.7)	28 (5.3)	10 (1.9)	12 (2.3)		
₦101,000-₦150,000	25 (4.8)	21 (4.0)	4 (0.8)	7 (1.3)		
₦151,000-₦200,000	37 (7.0)	15 (2.9)	13 (2.5)	7 (1.3)		
₦251,000-₦300,000	48 (9.1)	17 (3.2)	16 (3.0)	10 (1.9)	17.453	0.293
> ₦300,000	76 (14.5)	47 (9.0)	28 (5.3)	21 (4.0)		
Number of children						
1-4	216 (41.3)	124 (23.7)	68 (13.0)	52 (9.9)		
5-8	29 (5.5)	15 (2.9)	9 (1.7)	9 (1.7)	6.359	0.384
9-12	-	-	1 (0.2)	-		

* χ^2 = symbol for Chi square test.

Table 6 Underweight distribution based on socio-economic characteristic of mothers/caregivers.

	Normal No. (%)	Mild No. (%)	Moderate No. (%)	Severe n (%)	χ^{2*}	*p*-value
Maternal age						
15-30	170 (33.3)	48 (9.4)	18 (3.5)	5 (1.0)		
31-40	143 (28.0)	28 (5.5)	13 (2.5)	4 (0.8)		
41-50	53 (10.4)	10 (2.0)	5 (1.0)	3 (0.6)	5.082	0.955
51-60	6 (1.2)	1 (0.2)	-	-		
> 60	3 (0.8)	1 (1.1)	-	-		
Level of education						
None	2 (0.4)	2 (0.4)	1 (0.2)	-		
Primary	94 (18.4)	32 (4.3)	10 (2.0)	3 (0.6)		
Secondary	187 (36.6)	53 (10.3)	12 (2.3)	9 (1.8)	11.026	0.274
Tertiary	92 (18.0)	37 (7.2)	13 (2.5)	-		
Occupation						
Unemployed	6 (1.2)	-	-	-		
Employed	369 (72.2)	88 (17.3)	36 (7.0)	12 (2.4)	16.149	0.372
Income						
₦10,000 - ₦50,000	39 (7.6)	10 (2.0)	4 (0.8)	1 (0.2)		
₦51,000-₦100,000	50 (9.8)	24 (4.7)	7 (1.4)	2 (0.4)		
₦101,000-₦150,000	45 (8.8)	10 (2.0)	2 (0.4)	-		
₦151,000-₦200,000	53 (10.4)	11 (9.9)	3 (8.3)	1 (0.2)		
₦251,000-₦300,000	66 (12.9)	28 (5.4)	12 (2.3)	1 (0.2)	17.727	0.277
> ₦300,000	122 (23.9)	41 (8.1)	8 (1.6)	7 (1.4)		
Number of children						
1-4	325 (64.0)	114 (22.4)	32 (6.3)	8 (1.6)		
5-8	47 (9.3)	10 (2.2)	4 (0.8)	3 (0.6)	46.096	0.000
9-12	-	-	-	1 (0.2)		

* χ^2 = symbol for Chi square test.

Table 7 Nutrient intake of respondents and % RDA met.

Nutrient	Range	Mean ± SD	RDA	% RDA
Protein	8.06-25.04	15.77 ± 3.03	8.2 g/d	192
Carbohydrate	19.23-185.19	115.40 ± 16.10	100 g/d	115
Fibre	0.00-27.25	4.85 ± 4.52	22 g/d	22
Fat	2.13-16.11	9.70 ± 2.27	-	-
Vitamin A	4.19-297.59	189.28 ± 44.74	242.5 µg/d	78
Vitamin C	0.00-22.30	8.99 ± 5.30	17.5 mg/d	51
Vitamin B1	0.00-2.22	0.41 ± 0.32	0.45 mg/d	91
Vitamin B6	0.00-6.28	0.31 ± 0.33	0.45 mg/d	69
Zinc	1.44-3.00	2.31 ± 0.31	3.25 mg/d	71
Iron	1.02-7.92	2.53 ± 0.47	3.55 mg/d	71

Table 8 Nutrient adequacy ratio of the food consumed by respondents.

Nutrient	NAR (range)	Mean ± SD
Protein	0.5-1.57	0.99 ± 0.19
Carbohydrate	0.19-1.85	1.15 ± 0.16
Fiber	0.00-1.09	0.19 ± 0.18
Fat	0.21-1.61	0.97 ± 0.23
Vitamin A	0.02-1.42	0.90 ± 0.21
Vitamin C	0.00-1.49	0.60 ± 0.35
Vitamin B1	0.00-5.23	0.98 ± 0.73
Vitamin B6	0.00-12.56	0.62 ± 0.67
Zinc	0.58-1.20	0.92 ± 0.12
Iron	0.34-2.64	0.84 ± 0.16
MAR	0.40-1.70	0.72 ± 0.13

Table 9 Food groups consumed by the children.

Food groups	Frequency	Percentage
Cereals, roots and tuber	438	83.9
Vitamin A rich fruits and vegetables	139	26.6
Other fruits	34	6.5
Other vegetables	114	21.8
Meat, poultry and fish	316	60.5
Legumes and nuts	291	55.7
Fats and oil	145	27.8
Dairy	129	24.7
Eggs	83	15.9

Table 10 Dietary diversity score.

Dietary diversity score	Frequency	Percentage
< 4 food groups	268	51.3
4-6 food groups	244	46.7
> 7 food groups	10	1.9
Total	552	100

Table 11 Correlation between dietary diversity score and nutrient adequacy ratio of food consumed by the children.

	Dietary diversity score ($p < 0.05$)
NAR protein	0.08
NAR CHO	0.04

Table 11 to be continued

NAR fibre	-0.01
NAR fat	-0.04
NAR iron	-0.01
NAR zinc	-0.00
NAR vitamin A	0.10
NAR vitamin B1	0.07
NAR vitamin B6	0.00
NAR vitamin C	0.04
MAR	0.08

Table 12 Correlation between Dietary diversity score and children's nutritional status.

	Dietary diversity score
Wasting	-0.067
Stunting	-0.002
Underweight	-0.056

across both sexes. This value is higher than what was obtained in the Nigeria Demographic and Health Survey (NDHS) of 2008 [23] and 2013 [14] that showed stunting to be 41% and 37% respectively among under-five children; but lower than 56% (37% moderate, 19% severe) reported for 2018 NDHS [15]. The prevalence of severe stunting was slightly higher in male than in female children in this study. Prevalence of wasting in this study is slightly higher than the value currently reported for 2018 NDHS [15]. More males were wasted and underweight compared with female children. The finding in this study shows a higher prevalence of malnutrition in male than in female children in the study area, which is in line with previous studies [24-26].

There was higher prevalence of wasting, stunting and underweight among children whose mothers were between 19-30 years old compared to older mothers. This observation could be attributed to their inexperience in child care practices as compared to mothers/caregivers who are older and more experienced. This finding is in line with that of the study of Akorede and Abiola [27], who found that mothers aged 20 years and below had highest percentage of malnourished children. However, there was no correlation between the age of mothers and the nutritional status of their children in this study; and this is similar to what was reported by Gitau [28] in a study conducted in South-Africa that no significant relationship existed between the age of mothers or caregivers and child malnutrition. Wasting increased with the educational level of the mothers/caregivers in the study area, the higher the educational level, the higher the prevalence of wasting. Also, stunting and underweight were prevalent among under-five children of mothers/caregivers who were educated in line with the findings of Senbanjo et al. [22]. Reasons for this can be linked to the type of employment/jobs of the mothers which may reduce the time allocated to child care practices.

There was no significant relationship between the level of income and occupation of the mothers and the nutritional status of the children. However, mothers who had some form of employment had higher prevalence of malnutrition among their children which is in conformity with the study by Awogbenja and Ugwuona [29]. This might be due to the fact that less attention or care was given to the children of the employed mothers/caregivers due to job demands compared to children of the self-employed mothers. There was significant difference between the number of children a mother has and wasting and underweight. There was high prevalence of malnutrition generally among children of mothers who had between one and

four children. The reason for this observation is believed to be due to less attention being usually given to the pre-school children, especially with the arrival of a new baby, as well as rationing of food between the children.

A high percentage of the pre-school children consumed mainly cereal and root and tuber food groups (83.9%) which showed a monotonous diet based mainly on starchy staples [12, 30]. About half of the children (51.3%) consumed less than four food groups within the previous 24 hours. The mean dietary diversity score for the seven food groups consumed by the respondents 3.24 was similar to the mean dietary diversity score of 3.6 of 9 food groups reported by Steyn et al. [18], and lower compared to the minimum dietary diversity of at least four food groups a day which is generally associated with better nutritional status among children in all the age groups [25].

The mean adequacy ratio of foods consumed by the children was 0.72 which is low when compared with the result of the study by Hatloy et al. [7] with cut-off points of 0.75. The recruited children had high nutrient intake from carbohydrate food group, but low fibre intake. There was a positive correlation between nutrient adequacy ratio of carbohydrate, vitamin B1 and dietary diversity score of the food consumed by the pre-school children. There was also a weak negative correlation between the nutrient adequacy ratio of iron, fibre, vitamin A and dietary diversity score of the food consumed by the children. There was no relationship between nutrient adequacy ratio of zinc, protein and dietary diversity score. Previous studies in Ghana and Malawi [31] showed no correlation between proteins in both countries, corroborating the findings in this present study with nutrient adequacy ratio of these nutrients.

There was weak relationship between dietary diversity score (DDS) and nutritional status of the children, and this was similar to the finding of the study in Niger [32] which showed low correlation; and differed from previous studies carried out in Ethiopia and Mali in which there was strong association [9, 33]. This observed difference in association between countries may have to do with cultural practices which are beyond the scope of this study.

5. Conclusion and Recommendations

Low dietary diversity and malnutrition were found among pre-school children in the three LGAs (Egbeda, Ona-ara and Ido) studied. Dietary diversity and nutrient adequacy have direct bearing with the nutritional status of under-five children in the study area; and from the findings here, simple counts of food groups can be used as indicator of nutrient adequacy. There is need to further investigate the feeding habits of the mothers of under-five children and how it affects the food intake patterns of their children, as well as the role it plays in the nutritional status and health of their children. Employed young mothers need to be educated on the importance of good child care practices and necessity of good nutrition during the early years of a child.

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