NUTRIENT INTAKE AND ANTHROPOMETRIC STATUS OF PRESCHOOLERS IN UPLAND AND COASTAL REGIONS OF RIVERS STATE

Abstract

This work assessed the anthropometric indices, nutrient and energy intakes, and nutrient adequacy of some traditional dishes consumed by preschool children (2–5-year-olds), in Rivers West senatorial zone, Rivers State. A cross-sectional survey and quasi-experimental designs were used for the study. A multi-stage sampling technique was used to select 410 pre-school children from all the eight local government areas in the zone. Subsample of 41 respondents (10% of the sample size) was taken for weighed food intake study, which was conducted on two-week days, and one weekend day and the mean nutrient intakes calculated and compared with recommended nutrient intake (RNI). The anthropometric measurements were analysed using WHO Anthro software. Statistical Product and Service Solutions (SPSS, Version 25.0) software was used for statistical analysis. Descriptive statistics such as frequency, percentages, means, and standard deviation were used to present the findings. The prevalence of wasting, stunting and underweight in the study area was found to be 12%, 15% and 8.1%, respectively. The mid upper arm circumference (MUAC) showed a 15.3% prevalence of moderate acute malnutrition. More boys were stunted than girls (17.2% and 12.9%, respectively), more girls were wasted than boys (17.5% and 10.2%) and almost an equal percentage of underweight between boys and girls (9.5% and 10.6%, respectively). Most foods contributed more than 100% to the recommended nutrient intake as stipulated by FAO/WHO, except for folate which was low across all age groups and calcium which was 62% among children between the ages of 37-48 months.

Introduction

Preschool children are children within the age bracket of 2 to 5 years (Tyler, 2020). It is a unique stage in human development that is marked by rapid growth, with a steady increase in body size (height, weight and muscle tone) as well as improvement in organs and system functions (Graber, 2022; Tyler, 2020). Nutrition plays an essential role in growth and development especially in the first five years of life with its benefits lasting through life. Adequate nutrition enables the preschool child to develop skills, maintain concentration, improve memory and cognitive functions (Tandon et al., 2016), reduced risk of overweight and obesity in the short term (Jarman et al., 2022; Nasreddine et al., 2019; Scharf & DeBoer, 2016) and prevents the development of many diet-related diseases later in life (Orkusz, 2022; Poličnik et al., 2013). The nutrition of preschool children need special care and attention because this age is accompanied

by a decrease in appetite (Pye et al., 2022).). A diet poor in both quality and quantity is the primary cause of malnutrition. Globally, an estimated 149.2 million children under the age of five were stunted, 45.4 million wasted, and 38.9 million were overweight in 2020 (UNICEF/WHO/World Bank Group, 2021). Malnutrition can present as under nutrition (wasting, stunting, and underweight), over-nutrition (overweight and obesity) as well as micronutrient deficiency. Undernutrition is more profound among preschool children in poor developing countries of the world. The prevalence rates of stunting, underweight and wasting in Nigeria as reported by the NDHS, (2018) are 37.%, 23% and 7%, respectively. These figures reported above makes it imperative to assess the extent of malnutrition among pre-schoolers in Rivers state.

Materials and methods

This study was conducted in Rivers West senatorial zone in Rivers State. It is one of Nigeria's 36 states located in the South-South geopolitical zone, with two-thirds of it in the Niger Delta geographical terrain. The study adopted a cross-sectional survey and quasi experimental designs. The study population consisted of preschool children (2-5 years) from communities in Rivers West senatorial zone, Rivers State. Multistage sampling technique was adopted for selection of 410 pre-schoolers form eight (8) local government areas comprising of upland (4) and coastal (4) communities in the state. Simple random sampling by balloting with replacement was used to select a child per caregiver to obtain the calculated sample per community. This was to ensure adequate representation of all ages involved in the study. Selection was made after a verbal confirmation of their age by the care givers. A subsample of 10% was used for weighed food (41) intake studies. Selection was by balloting without replacement. Children within the ages of two to five years old, accompanied by parents or caregivers, happy, willing, available, and physically strong were chosen to participate in the study. Data collection tools and methods such as questionnaire, focus group discussion (FGD), measurements of height and weight, mid upper arm circumference, weighed food intake study and chemical food analysis were adopted for the study.

Data analysis

Weighed food intake

A three-day (two-week days and one weekend day) weighed food intake was carried out to determine energy and nutrient intakes of preschool children using a sub-sample (10%) who participated voluntarily. Demonstration was done on a set day in each community for participants. They were taught to weigh food and record accurately during the exercise. Research assistants lodged in the communities to supervise the exercise and equally assist. Kitchen scales of different capacities (10 kg, 5 kg, and 7000 grams) and record books were provided for accurate record keeping. Edible portions of raw ingredients and cooking pots were weighed and recorded prior to cooking. When the food was cooked, the pot containing the food was weighed and the prior weight of the pot was subtracted to get the exact weight of the food. Children's empty plates were also weighed, and portions weighed and served. After the meal, left over foods and wastes were weighed and subtracted from the original weights of the food served to get the actual quantity consumed; this was recorded in grams as stated in Okeke, Onyechi and Ibeanu (2011). Other food items such as fruits and snacks bought and eaten outside the home were estimated using household measures and the values recorded. The Nigerian Food Composition Table (Sanusi et al., 2017) and FAO/INFOODS food composition table for West Africa (Vincent et al., 2020) were used to obtain energy and nutrient values of the foods. Mean nutrient intake of three days were calculated and compared with recommended dietary allowance to obtain percentage contributions. Intakes that provided 100% of the RNI were taken as adequate (Ayogu, 2019).

Anthropometry

Anthropometric measurements of height, weight and mid upper arm circumference were taken from the children. The most frequently used anthropometric indices when assessing nutritional status in children are weight-for-height, height-for-age and weight-for-age (WHO, 2019). These parameters and mid upper arm circumference (MUAC) were used to assess their nutritional status. All anthropometric measurements were compared with WHO reference standards (WHO, 2009).

Weight measurement

Children were weighed using a flat bathroom scale (Salter CMS Ltd London) graduated in kilograms up to 120. Before measurements were taken, the scale calibration was brought to zero.

Children wore minimal indoor clothes, without shoes and accessories before being weighed. They were asked to stand erect and still at the centre of the scale unaided, with weight evenly distributed on both feet without holding anything for support, both arms by their sides, head and knees held as erect as possible. A total of three readings were taken and the average recorded. Measurement was read to the nearest 0.1 kg.

Height measurement

Height measurement was done against a vertical wall with an attached 300 cm/120 inches long measuring tape and a wooden rule that was placed on the upper most point on the head. Children wore minimal clothes so that the position of the body can be seen properly. They stood on a flat floor with no footwear on and both feet together to ensure evenly distribution of weight. Their heels were together against the wall and their heads positioned so that the line of vision is perpendicular to the body (Frankfurt position). Their arms hung freely to the sides, with their head, shoulder blade, buttocks and heels all touching the wall. Hair ornaments removed and buns were loosened. An average of three measurements were taken and recorded to the nearest 0.1 cm.

Mid Upper Arm Circumference (MUAC)

Mid upper arm circumference was taken on the left arm with the hand hanging freely beside the body with palm facing the thigh. The tape was placed around the upper arm, midway between the acromion process (bony tip) of the scapula and the Olecranon process (the point of the elbow). Measurement was read to the nearest 0.1 cm. Three readings were taken and the average calculated and recorded. MUAC measure of < 110 mm (11.0 cm) is an indication of severe acute malnutrition (SAM), between 110mm and 125 mm (12.5cm) is an indication of moderate acute malnutrition, 125 mm and 135 mm(13.5 cm) reveals that the child is at risk for acute malnutrition and over 135 mm (13.5 cm) shows that the child is well nourished (Mother and Child Health and Education Trust, 2019).

Data Analysis

Anthropometric measurements were taken in triplicates and the mean recorded. Data collected for the study (using structured questionnaire, observation and measuring equipment) were entered in Microsoft Excel spread sheets, coded, cleaned, edited, classified, and stored before

exporting into Statistical Product for Service Solution version 23 for Statistical analysis. Anthropometric measurements of the children were evaluated and processed into anthropometric index for weight -for-age, height-for-age, weight-for-height and mid upper arm circumference for age Z-scores using WHO Anthro plus software. The Z-scores were categorized using a WHO Classification for the children as severe stunting; moderate stunting; and normal for their height-for-age Z-core; severe wasting, moderate wasting, normal, moderate overweight and severe overweight for their weight-for-height Z-score; severe underweight, moderate underweight, normal, moderate overweight and severe overweight for their weight-for-age Z scores; and mid upper arm circumference indicators using standard procedure. The MUAC less than 12.5 cm suggests malnutrition; an d MUAC greater than 13.5 cm is normal.

Statistical Analysis

Statistical Product and Service Solutions (SPSS, Version 25.0) software was used for statistical analysis. Statistical analysis was carried out using descriptive statistics such as frequencies, percentages, means, standard deviations.

Result

Mean daily energy and macronutrient intakes of preschool children and FAO/WHO requirement is shown in Table 1. The mean daily energy and macronutrients intakes, and reference standards for preschool children. Children within the ages of 24 – 36 months were the only group that met and exceeded their energy requirement (122%). Protein requirement was also exceeded by all the age groups (314%, 116% and 149% respectively) while carbohydrate intake was drastically low (38.3%, 16%, and 22%, respectively) and didn’t meet the requirement for all the age categories. Fat intake is 25=35% of their total energy intake.

Table 1: Mean daily energy and macronutrient intakes of preschool children and FAO/WHO requirement.

Variables	Age (months)	Energy (kcal)		Protein (g)		Fat (g)		Carbohydrate (g)	
Mean daily Intake		1664.31	1446.84	78.44	142.07	75.59	96.43	260.28	303.93
FAO/WHO requirement	24 - 36	1360		25		NA		680	
Percentage Intake		122		314				38.3	
Mean daily Intake		1185.82	254.57	37.00	6.39	49.23	5.93	144.76	48.42
FAO/WHO requirement	37 – 48	1830		32		NA		915	
Percentage Intake		65		116				16	
Mean daily Intake	49 - 60	1499.99	565.16	47.63	25.07	57.07	22.31	201.39	84.56
FAO/WHO requirement		1830		32		NA		915	
Percentage Intake		82		149				22	

NA: not available. Carbohydrate taken as 50% of energy, (FAO/WHO, 2004)

Table 2 shows the mean daily micronutrient intakes of preschool children and FAO/WHO requirement. All the preschool children met their iron, iodine, zinc, and vitamin A requirement, however, the mean calcium intake of preschool children aged 37 – 48 months was far below the requirement (600 mg). Folate intake was low for all age groups (40%, 23%, and 28%, respectively). Mean intake for iodine was 582.9 (mcg) which is 647.7% of the requirement (90 mcg).

Table 2: Mean daily micronutrient intakes of preschool children and FAO/WHO/ requirement

Variables	Age (months)	Calcium (mg)	Iron (mg)	Zinc(mg)	Folate (mcg)	Vitamin A (µgRE)	Iodine (mcg)
		Mean	Mean	Mean	Mean	Mean	Mean
Mean daily Intake		532.17	24.09	17.97	59.59	1274.31	1025.13
FAO/WHO	24 - 36	500	11.6	3	150	400	90
Percentage Intake		106	208	599	40	319	1139
Mean daily Intake		372.03	12.88	18.54	45.70	1073.14	282.67
FAO/WHO	37 - 48	600	12.6	5	200	450	90
Percentage Intake		62	102	371	23	268.29	314
Mean daily Intake		739.67	15.61	18.21	56.66	1867.46	440.87
FAO/WHO	49 -60	600	12.6	5	200	400	90
Percentage Intake		123	124	364	28	466.87	490

(FAO/WHO, 2004)

Table 3 presents the mean daily nutrient intake of male and females, WHO reference standards and the percentage adequate intake of the pre-school children. There was no significant difference ($p > 0.05$) in the mean energy and nutrients intake of male and female pre-school children. The recommended energy and nutrients requirement compared with the percentage intake of the pre-school children showed that the percentage energy and protein met on intake were below the WHO recommended intake though there was no significant difference ($p > 0.05$) while the percentage requirement met on intake for iron, zinc, folate and vitamin A were greater than the WHO recommended intake levels.

Table 3: Mean daily energy, macronutrient and micronutrient intakes of preschool children according to their gender, FAO/WHO requirement and percentage of requirement met

	Energy and Nutrients Intake		Recommended Energy and Nutrients Requirement		Percentage (%) requirement	
Nutrient	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
	X	**X**	**X**	**X**	**X**	**X**
Energy (kcal)	1727.04	1369.83	1332.59	1368.32	139.99	108.16
Protein (g)	45.22	76.19	15.82	16.47	292.95	527.34
Fat (g)	49.62	79.22	0.0	0.0		
CHO(g)	270.65	180.31	130.0	130.0	208.19	138.70
Calcium (mg)	705.45	476.96	623.53	673.68	113.98	74.35
Iron (mg)	19.70	19.26	8.24	8.74	252.35	240.93
Zinc(mg)	18.86	17.49	3.82	4.16	508.09	459.77
Folate (mg)	50.79	61.80	170.59	178.95	29.77	36.39
Vitamin A	1373.41	1538.54	341.18	357.89	388.96	444.43
Iodine (mg)	819.02	614.39	90.0	90.0	910.02	682.66

FAO/WHO

Table 4 shows the anthropometric indices (MUAC, weight-for- age, height-for-age and weight-for-height) of preschool children according to their age groups (in months) and location. The MUAC-for-age showed that 8.5% of preschool children aged 24 -36 months in the upland region were at risk of malnutrition while 6.8% of preschool children between 49 – 60 months of age were at risk of malnutrition in the coastal region. About 93% had an optimal mid-upper arm circumference in both upland and coastal regions. Also, the weight-for-height Z-score revealed that 1.8% and 0.7% of preschool children in the upland and coastal region, respectively were severely overweight while 84.6% and 87.8% had normal weight-for-height. Moderate overweight and underweight was recorded for 5.6% and 7% respectively of preschoolers in the upland region and 7.2% and 1.4%, respectively for those in the coastal region. The heigh-for-age showed that 8.5% and 6.5% of preschoolers in upland and coastal regions respectively, were severely stunted, while the weight-for-height revealed that in the upland region, 5.7% and 10.1% were severely overweight and severely wasted, respectively.

Table 4: Anthropometric indices (MUAC, weight-for- age, height-for-age and weight-for-height) of preschool children according to their age groups (in months) and location (N=410)

Variables	Upland				Coastal			
	24 – 36	37 to 48	49 to 60	Total	24 - 36	37 to 48	49 to 60	Total
	n(%)	*n(%)*		*n(%)*	*n(%)*	*n(%)*	*n(%)*	*n(%)*
	n(%)							
MUAC-for-Age								
Wasting (< 11.5 cm)	12 (4.2)	3 (4.7)	5 (6.5)	20 (7.1)	2 (3.0)	1 (3.4)	3 (6.8)	**6 (4.3)**
Normal (≥ 11.5 cm)	130 (91.5)	61 (95.3)	72 (93.5)	263 (92.9)	64 (97.0)	28 (96.6)	41 (93.2)	**133 (95.6)**
Weight-for-Age Z-score(underweight)								
Severe Overweight (≥ +3 Z-score)	5 (3.7)	0 (0.0)	0 (0.0)	5 (1.8)	1 (1.5)	0 (0.0)	0 (0.0)	**1 (0.7)**
Moderate Overweight (≥ +2 to < +3 Z-score)	14 (10.2)	0 (0.0)	1 (1.4)	15 (5.6)	7 (10.8)	0 (0.0)	3 (7.1)	**10 (7.2)**
Normal (< +2 &> -2 Z-score)	107 (78.1)	58 (93.5)	66 (93.0)	231 (85.6)	55 (84.6)	28 (100.0)	39 (92.9)	**122 (87.8)**
Moderate underweight (≤-2 &> -3 Z-score)	11 (8.0)	4 (6.5)	4 (5.6)	19 (7.0)	2 (3.1)	0 (0.0)	0 (0.0)	**2 (1.4)**
Height-for-Age Z-score (stunting)								
Normal (< +2 &> -2 Z-score)	117(83.4)	54 (84.4)	67 (87.0)	238 (84.1)	51 (77.3)	27 (93.1)	39 (88.6)	**117 (84.2)**
Moderate stunting (≤-2 &> -3 Z-score)	10 (7.0)	6 (9.4)	5 (6.5)	21 (7.4)	9 (13.6)	0 (0.0)	4 (9.1)	**13 (9.3)**
Severe stunting (≤-3 Z-score)	15 (10.6)	4 (6.2)	5 (6.5)	24 (8.5)	6 (9.1)	2 (6.9)	1 (2.3)	**9 (6.5)**
Weight-for-height Z-score (wasting)								
Severe Overweight (≥ +3 Z-score)	8 (5.7)	2 (3.1)	2 (2.9)	12 (4.4)	4 (6.1)	2 (6.9)	4 (9.3)	**10 (7.2)**
Moderate Overweight (≥ +2 & < +3 Z-score)	10 (7.2)	8 (12.5)	3 (4.3)	21 (7.7)	9 (13.6)	2 (6.9)	2 (4.7)	**13 (9.4)**
Normal (< +2 &> -2 Z-score)	96 (69.1)	48 (75.0)	57 (81.4)	201 (73.6)	47 (71.2)	23 (79.3)	33 (76.7)	**103 (74.6)**
Moderate wasting (≤-2 Z-score & > -3 Z-score)	11 (7.9)	3 (4.7)	2 (2.9)	16 (5.9)	4 (6.1)	1 (3.4)	2 (4.7)	**7 (5.1)**
Severe wasting (≤-3 Z-score)	14 (10.1)	3 (4.7)	6 (8.6)	23 (8.4)	2 (3.0)	1 (3.4)	2 (4.7)	**5 (3.6)**

Table 5 presents the anthropometric indices (mid upper arm circumference, weight-for-age, height-for-age and weight-for- height) of the preschool children (2-5 years) according to their gender. Among the male children, 75.7% were normal weight-for-height z-score while 71% were normal among females. Overall, 73.4% of preschool children were normal among the 406 children. 82.8% of males had normal height-for-age z-score, while 87.1% were normal among the females. A total of 84.9 had normal height-for-age z-score amongst the 418 children. A good number of the male children (84.8%) had normal weight-for-age z-score while the female children were 81.3%. A total of 93.85 of the male children had normal mid-upper-arm-circumference while the females were 94.3%. A total number of 94% of the children had normal mid-upper-arm-circumference. There is no significant relationship (x^2= 1.587; p =0.811) between weight-for-age Z-score and the sex of the preschool children.

Table 5: Anthropometric indices (mid upper arm circumference, weight-for-age, height-for-age and weight-for-height) of preschool children (2-5 years) by gender

	Sex of child				
Variables	**Male *n* (%)**	**Female *n*(%)**	**Total**	***X*²-value**	***p*-value**
Weight-for-height *Z*-score					
Severe Overweight (≥+3 Z-score)	10 (4.9)	9 (4.5)	19 (4.7)	5.760	0.218
Moderate Overweight (≥+2 or <+3 z-score)	19 (9.2)	14 (7.0)	33 (8.1)		
Normal (<+2 or >-2 Z-score)	156 (75.7)	142 (71.0)	298 (73.4)		
Moderate Wasting (≤-2 or >-3 Z-score)	8 (3.9)	18 (9.0)	26 (6.4)		
Severe Wasting (≤-3 Z-score)	13 (6.3)	17 (8.5)	30 (7.4)		
Total	**206 (50.7)**	**200 (49.3)**	**406 (100.0)**		
Height-for-Age *Z*-score					
Normal (>-2 Z-score)	173 (82.8)	182 (87.1)	355 (84.9)	1.909	0.752
Moderate stunting (≤-2 or >-3 Z-score)	17 (8.1)	14 (6.7)	31 (7.4)		
Severe stunting (≤-3 Z-score)	19 (9.1)	13 (6.2)	32 (7.7)		
Total	**209 (50.0)**	**209 (50.0)**	**418 (100.0)**		
Weight-for-Age *Z*-score					
Severe Overweight (≥+3 Z-score)	3 (1.4)	5 (2.4)	8 (1.9)	1.587	0.811
Moderate Overweight (≥+2 or <+3 Z-score)	9 (4.3)	12 (5.7)	21 (5.0)		
Normal	177 (84.8)	170 (81.3)	347 (83.0)		
Moderate underweight (≤-2 or >-3 Z-score)	12 (5.7)	11 (5.3)	23 (5.6)		
Severe underweight (≤-3 Z-score)	8 (3.8)	11 (5.3)	19 (4.5)		
Total	**209 (50.0)**	**209 (50.0)**	**418 (100.0)**		
Mid upper arm circumference classification					
Wasting (< 11.5 cm)	13 (6.2)	12 (5.7)	25 (6.0)	0.043	0.837
Normal (≥ 11.5 cm)	196 (93.8)	197 (94.3)	393 (94.0)		

Total	**209 (100.0)**	**209 (100.0)**	**418 (100.0)**

Weight-for-height Z-score had 96% response rate, while all the other parameters had 99% response rate.

Discussion

Mean daily energy and macronutrients intakes of preschool children compared with

FAO/WHO reference standards. Based on the weighed food intake study, all the preschool children met and exceeded their protein requirement, but only children between ages 24-36 months met and exceeded their mean daily energy intakes as recommended by FAO/WHO (2006). Carbohydrate intake was low across all ages, this is the major reason for the low energy intakes of children between ages 37-48 months and 49-60 months as observed in the study. Adequate energy intakes at the preschool age is critical because children become more active and have increased metabolism (especially between ages 37 – 60 months), hence the intake should balance the energy expended to improve concentration and prevent constant fatigue. This finding is in line with a study carried out in south-west Nigeria by Agbon et al., (2010) which reported low energy values (1068 kcal), lower than the recommended values, even though the children's intakes of zinc, iron, vitamin A, and iodine met their requirement. The findings in this study is in contrast with Somorin and Ajieh, (2018) who reported energy and macronutrients intakes of 167% by preschool children in their study.

Preschool children also met their micronutrient intakes and exceeded the recommended values except for folate and calcium. Folate was very low across the different age categories. This is relatable as children are not known to love vegetables which are rich in folate and the recipes did not require lots of vegetables. Secondly most vegetable based dishes were consumed mostly as supper, reheated, and consumed the following day. The incessant reheating lea to loss of micronutrients in the food. This pattern of eating was also observed in a study carried out by Ayogu et al. (2017) that most night meals were reheated and consumed the following day to save time and resources. Calcium was also not met among children between the age of 37 – 48 months. Whole grain cereals, wheat and legumes were minimally consumed due to availability, affordability, cooking time and nutrition knowledge of caregivers.

Anthropometric Indices of Preschool Children

This study revealed that there were more stunted people in the coastal region when compared with the upland region and the boys were mostly affected. Living in coastal regions comes with many challenges, such as consumption of less animal protein due to availability, leading to consumption of fewer proteins. This is a major reason for the high stunting rate in the coastal areas. The reason for male stunting isn't known yet neither is there a scientific backing for it, however, as children gradually become less dependent on breast milk and become increasingly reliant on complementary foods, infections are more likely to occur especially in households where hygiene and sanitary practices are poor. This can result in constant illness and malnutrition. The high prevalence of stunting amongst the males as observed in this study agrees with a study conducted among ten countries in sub-Saharan Africa by Wamani et al., (2007). In the pooled analysis, the prevalence of stunting amongst male preschool children was 40% which is significantly higher when compared with female preschool of 36% ($p < 0.001$). The study suggests that male children under five years of age are more likely to be stunted compared to females in the same age group. Stunting among male preschool children was attributed to low socio-economic status (food insecurity) and poor nutrition knowledge of the mothers who are the primary caregivers. According to UNICEF-WHO-The World Bank, (2021) stunting has declined steadily over the past two decades but needs to progress speedily to be able to achieve the 2030 target of the United Nations Sustainable Development Goal 2 which aims at ending hunger, achieving food security, improved nutrition and sustainable agriculture. A recent study conducted in Ghana by Ali et al. (2017) also reported that male children were 9.8 times more likely to experience stunting. Stunting in males may be due to inadequate complementary feeding and repeated infections that children of this age group are exposed to. Despite the fact that there is a significant acknowledgement of the male susceptibility to stunting, there is paucity of data on the exact underlying factors though literature suggest that it is likely to be biological (Fenske et al., 2013).

There were also more underweight females (10.6%) than males (9.5%). This result is consistent with earlier studies conducted among preschool children by Duru et al. (2015) and Okari et al., (2019) (both in Rivers East Senatorial Zone) and Flailih & Elhisadi, (2018) in north-east Libya. These studies reported higher underweight prevalence among female preschool children when

compared with the boys. The reasons were attributed to the patrilineal style of leadership/parenting practiced in the study area which is also practiced in our study arear. Prevalence of underweight in the first 1000 days of a preschool child especially the females predispose them to incessant ailments and also having children with low birth weight later in life. According to Flailih & Elhisadi, (2018), the odds of having underweight preschool children may be 2.4 times more common among children who consumed adult meals as first complementary food compared with children who consumed porridge as the first complementary food. Other factors are late initiation of complementary feeding, poor feeding practices and poor nutrition knowledge of the caregivers.

MUAC also showed the prevalence of acute malnutrition. The prevalence of malnutrition in the region agrees with an earlier study carried out in Rivers East Senatorial Zone on anthropometry and nutritional status of preschool school children which reported a prevalence rate of 7.7%, 21.0%, and 8.0% for wasting, stunting, and underweight, respectively (Duru et al., 2015). Similar studies carried out in south eastern Nigeria by Ibeanu et al., (2012) and in south west Nigeria by Akorede & Abiola, (2013) also attested to the prevalence of malnutrition amongst the under-fives with 1.7% underweight, 11.9% wasting, and 0.8% stunted in the east while 14.8%, 12.5%, 8.5% were reported to have been wasted, stunted and underweight in the west, though these findings are lower than the 2018 NDHS report which stated the prevalence rates of stunting, underweight and wasting in Nigeria as 37%, 23%, and 7.0%, respectively (NDHS, 2018).

Conclusion

Based on the anthropometric indices, there was a high prevalence of wasting, stunting and underweight, with wasting having the highest prevalence. There were also more females who were underweight and wasted than males, while boys were more stunted than the girls. Traditional foods with good nutrition profiles were consumed by the children. Aggressive nutrition education aimed at educating mothers and children on the importance of good nutrition especially at the preschool phase should be embarked on at the earliest by nutrition officers attached to the community health centres. The focus should be on food preservation, food processing and cooking methods, and proper food selection and combinations to address the malnutrition in the area.

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