

Assessment of Food Consumption Pattern and Nutritional Status of Pre-school Children in a Rural Nigerian Population

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Abstract This study investigated the food consumption pattern and nutritional status of three hundred (300) pre-school children in the rural area of Ikwuano Abia State, Nigeria. Availability (80.0%) determines the type of foods consumed. Frequency of meals was more than 3times for 70%. The commonly (92.9%) skipped meal was breakfast. All subjects snack. The subjects had moderate consumption of rice, biscuits, meat, beans, yam, cassava, cocoyam, potatoes, plantain, banana, garden egg, spinach (*Telferia*) leaves and palm oil but low consumptions of milk and milk products. The mean (SD) of anthropometric indices were height 1.0 (1.8)m, weight 18.4 (4.2)kg, Bicep 9.2 (1.6)mm, Triceps 9.2 (1.6)mm; MUAC 7.4(1.9)mm. Low percentages (0.7%) were severely under-weight, 25% were severely stunted and 6% were severely wasted. The BMI of subjects revealed that 35% was obese, 6.7% overweight and 10.7% were at risk of overweight. Nutrition education is advocated for both parents and children.

Index Terms: Consumption pattern, Food, Nutritional status, Pre-school children, Rural population.

1 INTRODUCTION

FOOD consumption patterns are personal behaviors that are developed over the years and may be influenced by physiological and social factors [1]. The type and the amount of food an individual chooses to consume affect his or her well-being and have implications for the society as a whole [2]. Factors like preference, ethnicity, values, habits and availability affect dietary pattern and determine the nutritional and health status of people [3]. Adequate food intake is essential for nutritional well being and plays a role in preventing morbidity and mortality [4]. Under nutrition in childhood has been reported to be the underlying cause of millions deaths and disease burden in children younger than 5 years each year [5]. Malnutrition is known to constitute a huge problem for the global community. World Health Organization [6] documented that malnutrition concerns not enough food, too much food, the wrong types of food and the body's response to a wide range of infections that result in malabsorption of nutrients, or inability to use nutrients properly to maintain health. Sanders [7] revealed that malnutrition affects almost 30 percent of children in Africa.

One third of children under-five are chronically undernourished [8] Additional data revealed that in Sub-Saharan Africa, the number of children under five who are low weight-for-age or low height-for-age is steadily on the increase [9] and over 200 million under five years old in developing countries do not reach their full potential [10]. It is further

is affected by malnutrition [11]. In Africa, the prevalence of malnutrition is 34.5% [12], while in Nigeria as much as 42% of 1 -5years children are affected by chronic long standing malnutrition [13]. This problem of malnutrition has reached the stage where it is now being referred to as the "double burden of malnutrition", a situation where under nutrition and over nutrition co-exist, at first more in urban than rural areas, but then increasingly in the same communities and eventually even in the same households [14]. One of the Millennium Development goals is to reduce under-five mortality rates by two thirds [15]. Currently, the global community is experiencing high food prices. Haddad [16] reported that even before these high food prices, child under nutrition was increasing in Africa; and that if undernourished children survive their first months of life, they will suffer more illness, learn less in school and be less productive in the workforce and; in turn, their children are more likely to be born undernourished. These recent food and economic crisis have magnified the challenge of under nutrition [17] and a lot of people suffer from hunger. Children under-five are especially vulnerable to food issues as the problem confronting them includes not only macro nutrient deficiencies but also micro nutrients deficiencies. Their growth is very rapid and have to be sustained by constant supply of adequate essential nutrients to enable them attain their full potential. The prevention of under nutrition is vital for reducing mortality and morbidity, for economic productivity and for the respect and protection of human rights [8]. The nutrition of world's children desperately needs improving failure of which will violate their human rights and undermine development today and in the next generation. Measuring the nutritional status of children is particularly important because nutrition losses incurred in childhood represent losses children will carry throughout life. It is therefore imperative to assess the food

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documented that as much as 60% of the global community

consumption pattern and nutritional status of rural pre-school children in particular areas.

2 MATERIALS AND METHODS

2.1 Study Design

A cross-sectional study of the effect of food consumption pattern on nutritional status of three hundred (300) pre-school children was conducted in the rural area of Ikwuano Local Government Area of Abia state, Nigeria.

Study Area: Ikwuano Local Government Area is located nine (9) kilometers east of Umuahia, Abia state capital on the Umuahia-Ikot Ekpen Road [18]. It has a population of one hundred and fifty seven thousand, six hundred and fifty six people (157,656) and forty-four autonomous communities [18]. It has boundaries with Bende LGA, Isiala Ngwa, Umuahia North LGA and Akwa-Ibom state. The climate is typical of the humid tropics and fairly even and uniform temperature throughout the year. The crops commonly grown in the area includes cassava, maize, yam, rice, sweet potatoes, African Yam Bean etc. The majority of the people are predominantly skilled laborers, followed by traders who engage in different business activities alongside civil service and farming.

2.2 Sampling Procedure

Twenty percent of the forty-four autonomous communities in Ikwuano LGA were purposively selected from which a simple random sampling method was used to select 300 pre-school children from households who gave their consent.

2.3 Data Collection

A structured interviewer-administered questionnaire was designed for the study. It was validated for content by nutrition experts in the Department of Human Nutrition and Dietetics, Michael Okpara University of Agriculture Umudike and pre-tested before administering it to the respondents. The respondents were the parents of the pre-school children (subjects) as they could not fill the questionnaires by themselves. The questionnaire was used to obtain information on children's personal data, parents' socio-economic characteristics and food consumption pattern of the subjects. Anthropometrics data such as weight, height, Body Mass Index (BMI), skinfold thickness and Mid-upper Arm circumference (MUAC) of the subjects were assessed. The weights of the children were taken with minimal clothing on a bathroom scale (Model BR 9012). The scale was placed on a flat surface and always set at zero reading before every measurement. Measurements were read and recorded to an accuracy of 0.1kg [19]. The height was also measured to the nearest 0.01meter using a height gauge - a vertical calibrated board with a fixed base and a movable headpiece. This was placed on a hard leveled surface against a wall. The child was made to stand erect on the base plane without shoes and head gear in order to give accurate distance between the side of the feet and the

crown of the head. As the child was looking straight ahead, the headpiece was lowered on top of the head and measurement were read and recorded to the nearest 0.01m [19]. MUAC was measured using a flexible non-stretchable tape. The subjects were made to stand straight with the arms hanging as free as possible. The tape was then wound round the midpoint of the left upper arm between the shoulders and elbow tip making sure that it was neither too tight nor too loose; the measurements were read and recorded to the nearest 0.1cm. The selected skin fold thicknesses were measured using skin fold caliper. The flesh of the respondent at the selected point was picked up with the caliper and the readings recorded to the nearest 0.1mm.

2.4 Data Analysis

Data generated from this study were coded and then keyed into Excel spreadsheet and later summarized using statistical software STRATA 8A which employed descriptive statistics of mean \pm standard deviations (SD), frequencies and percentages. The weight and height measurements were used to calculate the BMI (weight (kilogram)/height (meter)²). The children were classified using the WHO [20] reference BMI-for-age and height-for-age -Z-scores for pre-school children. Children $>+2SD$ were classified as obese, between $+1SD$ and $<+2SD$ as overweight; $<-1SD$ to $-2SD$ was classified as underweight, while $<-2SD$ were classified as thin. For stunting, children $<-3SD$ were classified as severely stunted; those $<-2SD$ as moderately stunted; and those $<-1SD$ as mildly stunted. The skin fold thicknesses and MUAC value were compared with WHO reference standard [21].

3 RESULTS

3.1 Personal and family characteristics of rural pre-school children in Ikwuano Abia state

The age of the children ranged from 2-5 years (Table 1). More than half (57.7%) were males while 42.3% were females. Approximately 37% were in Nursery three, 32.7% in nursery two and 30.6% in nursery one. A high percentage (70.0%) of the children had married parents; 15%, 5% and 10% had single, divorced and widowed parent respectively. Majority (85.0%) of the children came from monogamous than polygamous (15%) families. Eighty percent of the children live with both parents while 15% and 5% live with only mother and only father respectively. Many (45%) were from moderate size families with 4 - 5 persons; 25% from families with 6 - 7 persons while 15% were from families with 8 - 9 persons and 2 - 3 persons respectively. Up to 30% were 3rd children in the family, 2nd and 4th position 20% each, while 1st children were only 10%. Twenty-five percent of the parents were less than 36years old; the same percentage was within the age range of 36 - 40 years and 46 - 50 years respectively; 10% were aged between 41 - 45 years old and 15% were above 50years old.

3.2 Socio-economic characteristics of families of rural pre-school children

As much as 42.3% use public transport (school bus, tricycle etc) to school; 38.3% used private vehicles while 19.3% trek to school. Most of their houses were of bungalow (80%) with corrugated iron sheets (table 2), storey building (10%), mud (6%) and others (4%). More mothers (70%) than fathers (60%) had secondary education while more fathers (40%) than mothers (30%) had tertiary education. The primary occupation of mothers was skilled labor (70%) and fathers trading (50%). Thirty-five percent of the parents had a monthly income range of ₦11,000 - ₦20,000 while as much as 15% earned less than ₦11,000 monthly. The monthly food expenditure was less than ₦6,000 for 40% of the families, and less than ₦20,000 for 5% of the families.

3.3 Food consumption pattern of rural pre-school children in Ikwuano

Table 3 shows that foods eaten by the children were determined by availability of food (80%), nutritional value (15%) and child's choice (5%). Family food purchases were frequently made by mothers (70%) while 6% fathers, 15% relations and 9% house-helpers were also involved. Decision on what food is eaten is made by 55% fathers, 30% mothers and 15% relations. Food preparation was by mothers (85%), fathers (5%) and relation (10%). Most (85%) of the children ate their meals individually, only 5% had collective meals while 10% ate both individually and collectively. A high percentage of the children feed themselves, 15% and 5% were fed by parents (mothers 15%, fathers 5%). The daily frequency of meals was more than 3 times for 70% of the children, 3 times for 17.3% and less than 3 times for 12.7% of the children. The quantity of meals eaten was adequate for 90% of the children and inadequate for 10%. Sixty-five percent claimed that the meals eaten by the children were nutritious while 35% of the respondents said that the children ate meals that were not nutritious. The children favorite foods included noodles (45%), rice and stew (40%) and beans and plantain (15%). Most (70%) of the children skipped meals while 30% claimed that they do not skip meals. The frequency of meal skipping was less than once a week for 35% of the children and 1 - 2 times a week for 64.3%. Unavailability of food (42.9%), food dislike (42.9%), no one to cook (7.1%) and limited time to feed (7.1%) were the reasons for meal skipping. Meals usually skipped were breakfast (92.9%) and lunch (7.1%). Sixty-five eat small quantity of meals when sick while 35% starve when sick. All the children snacked and favorite snacks were biscuits (60%) and cheese balls (40%). The frequency of snack consumption was daily for 75% of the children and 2 times a week for 25%. Reasons for snacking were likeness (60%) and unavailability of food (40%). The frequency of food consumption (table 4) shows that rice and meats were eaten by 110 children 5-6 times a week. Beans (140), maize (120), biscuits (127), yam (150), garri (145), potatoes (133), cocoyam (195), *Telferia* (120), garden egg (210) and palm oil

(167) were also consumed by the children 5-6 times a week. Milk powder (150), yoghurt (135) and evaporated milk (105) were consumed by the children 3-4 times a week.

3.4 Nutritional status of pre-school children in Ikwuano Abia State

The mean and standard deviation (SD) of the children anthropometric indices was 18.4(4.2)kg weight, 1.0 (1.8)m height, 18.1 BMI, 7.4 (1.9)cm MUAC, 9.2(1.6)mm Biceps and 9.2 (1.6)mm Triceps (table 5a). The weight-for-age data revealed that 0.7%, 1.7% and 97.7% of the children were severely underweight, underweight and normal respectively (table 5b). Height-for-age shows that 25% were severely stunted, 6% stunted and 69% had normal weight-for-age. Six percent of the children were severely wasted, 6.7% wasted and 87.3% had normal weight-for-height. The BMI of the children shows that as much as 35.3% were obese, 6.7% overweight, 40.7% at risk of overweight and 47.3% normal.

4 DISCUSSION

The data obtained from this study revealed that most of the children had good family characteristics as majority had married parents in their active age, were from monogamous and moderately-sized families and live with both parents. These characteristics translated to a suitable home environment that can support the well-being of children. According to Schneider [22] the child's well-being is affected by his/her environment (including the home) which is largely influenced by the family structure, composition and relationship to members in the household. The moderate-sized families of 4 -5 persons, and the active age (<50years) parents could be a pre-requisite to achieving food security - a situation that pertains when "all people", "at all times", have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life [23]. Individuals with large family responsibility need to be economically viable to ensure food security [24]. In this study, the active age parent will be physically and economically able to fend for moderate-sized families as compared with older parents with diminished physical capacity to engage in productive work to sustain a good standard of living. This is because there are indications that the ability of older adults compared to younger adults to generate sufficient income from their labor/work is restricted [25]. Keino [26] revealed that the educational level of individuals significantly affect their health and nutritional status. Most of the parents of the study children had secondary education status and it is therefore expected that they will know what constitute an adequate diet. According to Duffy [27], an individual who does not know what constitute an adequate diet is not likely to consume the right type of food. The educational level of 85% of the study parents translated to a monthly income of ≤₦50,000 and food expenditure of ≤₦15,000 for 85% of the parents. De Irara-Esterez *et al.*, [28] stated that low income groups

have the tendency to consume less adequate diets. Similarly FAO/WHO [29] revealed that with better purchasing power, an individual can get better and nourishing meals. Availability of food was the main determinant of what is eaten. This is because in rural areas households consume what is seasonally available from their farmland and forest; unlike in the urban areas where household income is the main determinant of what is eaten. Mothers in this study were mainly in charge of food purchases and preparation. This is conformity with the work of Steven [30] who reported that mothers are culinary experts that prepare food to be consumed by family members. In this study, father's decision plays a significant role in influencing what meals the family consumed. This is because in a typical African setting, fathers are seen as the traditional heads of household, a chief breadwinner whose central role is to provide for both immediate and extended family members [31]. They are accorded enormous respect and mothers usually strive to please them in conformity with the African adage which says that "the way to a man's heart is through his stomach;" consequently, mothers usually request to know what the fathers' will like to be served and ensure it will be served. The individual meal distribution as employed by most of the study families provides an opportunity for ascertaining what each child consumes at a time. Many of the children were fed by older relatives. This is could be because child feeding requires time and patience and most parents are usually engaged in activities to make ends meet to spare ample time for child feeding. Majority of the children in this study ate >3 times in a day. This is expected because in rural communities where there are lots of farms and forests that provide enormous fruits and vegetables, parents have less control over what their children eats in the afternoon (after school). The poor quality food fed to the children as reported in this study is in consonance with the work of Ene-Obong and Ekweagwu [32] who reported that the quality of food consumed by rural families is likely to reduce due to poor storage facilities, inadequate reheating and the losses due to reheating. The favorite meals (stewed rice and noodles) consumed by the study children is because rice is a major staple in the study area [33]; it could also be because of palatability and convenience as these meals are easily eaten without stress. Children are known to favor tasty meals that will give them less stress. Most of the children skipped breakfast. This finding is similar to the work of Sjoberg [34] who reported that despite the benefits of consumption of breakfast, it is the meal commonly skipped by young people. The skipping of breakfast by the study population was because parents are always in a hurry to send their children to school so as to catch up with their businesses. Onofiok *et al.* [35] stated that the usual practice of skipping breakfast is a function of most subject leaving home early for trading (in this case school) and will pre-dispose certain individual to the inability to meet the requirement for most of the problem nutrients in the region. The high level of meal skipping as recorded in this study was attributed to

unavailability of food and food dislike. Popkin [36] documented that high cost of food stuff influences what people eat and the food choices available to them. The frequency of meal skipping and the particular meal skipped in this study implied that these children may not meet their nutritional needs. Similar observation were reported by Keski-Rahkonen *et al.* [37] who reported that skipping breakfast is associated with health compromising behaviors in adult and adolescents. It is important to note that despite the level and frequency of meal skipping in this study, all subjects still ate snacks; indicating that the skipped meals were later substituted with snacks. This study recorded a high frequency of snacking. Olumakaiye *et al.* [38] reported that frequency of snacking can adversely affect students' health status given the abundance of energy dense and high fat ingredients they contain. It is sadden to observe that the children did not consume healthy snacks like groundnuts, bananas, fried bean balls, cassava chips with oil bean seeds etc. This may be because of ignorant of the fact that these nutrients-dense foods can serve as snack. The reasons for snacking (likeness and availability) are similar to the work of Yahia *et al.* [39] where subjects selected fast foods due to its palatability, availability and convenience. The eating of small quantity of foods or skipping of meals when sick by the study children is attributed to loss of appetite. Ill health has been known to affect the appetite of the affected. The high weekly frequency of consumption of yam, cassava potatoes and cocoyam (Table 4) was because these foods form the major staple produced in the study area. Tropical tuber crops feature as major food items in the diet of people [40]. Vegetables, fruits, rice and fat/oil were also highly consumed. These foods are usually very much available in rural communities. The consumption of fish and legumes were appreciably low. This finding indicates that although these foods were equally available in the study area, they are usually seen as luxury foods and are very expensive; only economically viable households can afford them on a daily basis. The overall consumption of milk and milk products was very low as none of the study children consumed them up to 5 - 6times a week. This is very unfortunate since milk is extremely valuable in the diet and can contribute to the daily nutrients intake of children and adults alike. According to Kon [41], milk is nutrient-rich food that provides a large number of nutrients relative to the calories consumed. Its' products have been shown to reduce plaque and stimulate saliva which helps to keep the mouth clean, very good for strong and healthy teeth [42]; prevent many forms of illness and diseases [43]. Not all the children consumed fish, butter, and fresh tomatoes. This is worrisome because Florence *et al.* [44] identified diet adequacy, variety and increased consumption of fruits and vegetables as specific aspects of diet quality important to academic performance. It is therefore not surprising that there is the existence of double burden of malnutrition among the study children. Some were severely underweight, stunted, wasted and obese (table 5a). This situation calls for urgent action since

malnutrition even in its mildest forms during childhood can have detrimental effects on the behavior of children, their school performance and overall cognitive function [45]. However many of the children had normal weight for age, normal height for age and normal weight for height; very few were underweight; that is, the prevalence of underweight in this study was 2.4%, stunting 31% and wasting 12.7%. This is quite low compared to previous studies of rural school children in low income countries which reported overall prevalence of stunting and underweight to be high; Partnership for Child development [46] 48 - 56% stunting; 34 - 62% underweight; Nabag [47] 59.1% underweight; 47.7% stunting in Khartoum State, Sudan; Olusanya [48] 49.3% - 51.3% underweight; 21.6% stunting in Ogun State Nigeria. This could be attributed to the family characteristics, meal and snacking frequencies of the study children.

5 CONCLUSION

Food consumption pattern have significant influence on the nutritional status of the study children. It is therefore imperative to advocate for nutrition education of what constitutes an adequate diet for both the families and the children to help the children achieve their full potential.

6 Acknowledgments

The author wish to thank H.C.Unaeze, and LN. Ejiofor for their financial support.

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TABLE 1

PERSONAL AND FAMILY CHARACTERISTICS OF RURAL PRE-SCHOOL CHILDREN:

Personal/characteristics	Frequency (%)
Gender	Male 173 (57.7%) Female 127 (42.3%)
Age	2 years 69 (23.0%) 3 years 73 (24.3%) 4 years 77 (25.7%) 5 years 81 (27.0%)
Nursery class	One 92 (30.6%) Two 98 (32.7%) Three 110 (36.7%)
Marital status	Married 210 (70.1%) Single 45 (15.0%) Divorced 15 (5.1%) Widowed 30 (10.0%)
Family type	Polygamous 45 (15%) Monogamous 255 (85%)
Child lives with	Both parents 240 (80.0%) Mother alone 45(15.0%) Father alone 15 (5.0%)
Family size	2-3 persons 45(15.0%) 4-5 persons 135 (45.0%) 6-7 persons 75 (25.0%) 8-9 persons 45 (15.0%)
Child position in the family	First 30 (10.05) Second 60 (20.0%) Third 90 (30.0%) Fourth 60 (20.0%) Others 60 (20.0%)
Parents' age	<36 75 (25.0%) 36-40 75 (25.0%) 41-45 30 (10.0%) 46-50 75 (25.0%) >50 45 (15.0%)

TABLE 2

SOCIO-ECONOMIC CHARACTERISTICS OF FAMILIES OF RURAL PRE-SCHOOL CHILDREN

Variables	Frequency (%)		
Means to school	Trekking	58 (19.3%)	
	Public vehicles	127 (42.3%)	
	Private vehicles	115 (38.3%)	
Housing type	Bungalow	240 (80.0%)	
	Storey building	30 (10.0%)	
	Mud house	18 (6.0%)	
	Others	12 (4.0%)	
Parental occupation	Civil servant	90 (30.0%) F -	
	Skilled laborer	- 210 (70.0%) M	
	Unskilled labor	45 (15.0%) F 90 (30.0%) M	
	Trading	150 (50.0%) F -	
	Farming	15 (5.0%) F -	
	Parental education	Secondary level	180 (60.0%)F 210 (70.0%)M
Tertiary level		120 (40.0%)F 90 (30.0%)M	
Monthly income	< ₦11,000	45 (15.0%)	
	₦11,000 – ₦20,000	105 (35.0%)	
	₦21,000 – ₦30,000	15 (5.0%)	
	₦31,000 – ₦40,000	45 (15.0%)	
	₦41,000 – ₦50,000	30 (10.0%)	
	> ₦50,000	60 (20.0%)	
	food expenditure per month	< ₦6,000	120 (40.0%)
		₦6,000 – ₦10,000	135 (45.0%)
₦16,000 – ₦20,000		30 (10.0%)	
> ₦20,000		15 (5.0%)	

F =Father M = Mother

TABLE 3

FOOD AND SNACK CONSUMPTION PATTERN OF RURAL PRE-SCHOOL CHILDREN IN IKWUANO:

Consumption pattern variables	Frequency (%)	
Determinant of food consumed	Availability	240 (80.0%)
	Child's choice	15 (5.0%)
Family food purchases by	Nutritional value	45 (15.0%)
	Mother	210 (70.0%)
	Father	18 (6.0%)
Decision of what is eaten	Relation	45 (15.0%)
	House help	27 (9.0%)
	Mother	90 (30.0%)
Food preparation by	Father	165 (55.0%)
	Relation	45 (15.0%)
	Mother	255 (85.0%)
Food distribution	Father	15 (5.0%)
	Relation	30 (10.0%)
	Individually	255 (85.0%)
Child feeding	Collectively	15 (5.0%)
	Individually + collectively	30(10.0%)
	Mother	45 (15.0%)
Number of times eaten per day	Father	15 (5.0%)
	Self	215 (71.7%)
	House help	25(8.3%)
	<3 times	38 (12.7%)
Quantitative adequacy of meals	3 times	52 (17.3%)
	>3 times	210 (70.0%)
	Adequate	270 (90.0%)
Qualitative adequacy of meals	Not adequate	30 (10.0%)
	Nutritious	105 (35.0%)
Child's favorite meal	Not nutritious	195 (65.0%)
	Noodles	135 (45.0%)
Meal skipping	Rice and stew	120 (40.0%)
	Beans and plantain	45 (15.0%)
	<1 times per week	75 (35.7%)
Reasons for skipping meals	1 – 2 times per week	15 (64.3%)
	No one to cook it	15 (7.1%)
Meals usually skipped	Food not available	90 (42.9%)
	Food dislike	90 (42.9%)
	Limited time to feed	15 (7.1%)
eating pattern when sick	Breakfast	195 (92.9%)
	Lunch	15 (7.1%)
Snack consumption	Eat small quantity	195 (65.0%)
	Skip meals	15 (7.1%)
Favorite snacks	Eats snacks	300 (100%)
	Biscuits	180 (60.0%)
	Cheese balls	120 (40.0%)
Snacking	Daily	225 (75.0%)
	2 times per week	75 (25.0%)
Reasons for snacking	Likes snacks	180 (60.0%)
	Food not available	120 (40.0%)

TABLE 4
THE FREQUENCY OF FOOD CONSUMPTION

Type of food	frequency	
	5 – 6 times/wk	3 – 4 times/wk
Meat & fish		
Meat (beef)	110	20
Egg	30	135
Fish	10	75
Snail	50	155
Crab	90	105
Stockfish	35	110
Milk & products		
Milk powder	-	150
Yoghurt	-	135
Evaporated milk	-	105
Legumes		
Beans	140	110
Groundnut	-	225
Akara (fried bean balls)	30	165
Melon seed	15	60
Oil bean seed	30	120
Bread fruit	-	195
Bread & cereals		
Rice	110	140
Maize	120	150
Bread	86	67
Millet	45	105
Spaghetti	15	120
Cornflakes	45	210
Akamu (corn gruel)	128	19
Doughnut	-	10
Meat pie	40	15
Biscuit	127	117
Root & tubers		
Yam	150	60
Garri (fried cassava paste)	145	85
Abacha (cassava chips)	30	75
Potatoes	133	158
Cocoyam	195	90
Fats & oil		
Groundnut	5	85
Palm oil	167	37
Butter	20	45
Fruits & Vegetables		
Okro	-	230
Anala leaf (<i>Solanum</i>)	-	180
Ugu leaf (<i>Telferia</i>)	120	135
Carrots	15	195
Orange	70	30
Garden egg	210	60
Fresh tomato	23	81
Cashew	45	165
Plantain	195	60
Banana	105	180
Avocado pear	30	135
Paw-paw	60	120

Wk = week

TABLE 5A
Anthropometrics Indices of Pre-school Children in Ikwuano Abia State

Anthropometric index	Mean	Standard deviation
Weight (kg)	18.4	4.2
Height (m)	1.0	1.8
BMI (kg/m ²)	18.1	2.3
MUAC (cm)	7.4	1.9
Bicep(mm)	9.2	1.6
Triceps(mm)	9.2	1.6

TABLE 5B
Prevalence of Malnutrition among Rural Pre-school Children in Ikwuano

Variables	Frequency (%)	
Weight-for-age	Severely underweight	2 (0.7%)
	Underweight	5 (1.7%)
	Normal	293 (97.7%)
Height-for-age	Total	300 (100%)
	Severely stunted	75 (25.0%)
	Stunted	18 (6.0%)
Weight-for-height	Normal	207 (69.0%)
	Total	300 (100%)
	Severely wasted	18 (6.0%)
BMI	Wasted	20 (6.7%)
	Normal	262 (87.3%)
	Total	300 (100%)
	Obese	106 (35.3%)
	Overweight	20 (6.7%)
	Possible risk of overweight	32 (10.7%)
	Normal	142 (47.3%)
	Total	300(100%)