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Nutritional Status of Pre-School Children in Urban and Rural Areas of Owerri North, Imo State, Nigeria

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Abstract:
The study compared the nutritional status of pre-school children (3-5 years) in urban and rural areas of Owerri North, Imo State, Nigeria. Three specific objectives and two hypotheses guided the study. Cross-sectional survey was conducted on a random sample of 200 pre-school children (100 urban and 100 rural) which were used for the study. Anthropometric, dietary (weighed food intake and 24 hour recall), and socio-economic indices were used. The anthropometric results were compared with the WHO standards using the indicators; stunting, under weight and wasting. Nutrient intake of the children was compared with the RDA. Results showed no significant difference ($P<0.05$) between the mean height and weight of urban (1.1m and 16.0kg) and rural (1.1m and 15.9kg) children. For height-for-age, 5% of urban and 11% of rural children were stunted, while weight for-height showed that 2% of urban and 17% rural children were wasted. Mean Protein intake was below RDA in rural children (18.4mg) but within the RDA in urban children (23.5mg). However, Energy, Vitamin A and Iron intakes were below RDA in both areas, whereas Carbohydrate and Vitamin C intakes were above the RDA, among other results. The study concluded that the children in the urban area had more adequate nutrition and recommended nutrition education for mothers, particularly those in rural areas to help them understand the basic nutritional needs of their children, as ignorance of the right kinds of food to eat certainly leads to poor or under-nutrition.

Keywords: *Nutritional Status, Pre-School Children, Anthropometry, Dietary Intake, Malnutrition.*

1. Introduction

Children, especially those of pre-school age (3-5years) are vulnerable nutritionally, and this is mainly due to their easy susceptibility to malnutrition and infection. Wardlaw, Hampl and DiSilvestro (2007) described malnutrition as the failing health that results from long-standing dietary practices that do not correspond with nutritional needs. It includes all deviations from adequate nutrition, including under-nutrition and over-nutrition. Regrettably, poor nutrition is a very common condition among under-five aged children in poor and developing countries (WHO, 2006; Onimawo, 2001). Malnutrition is associated with more than half of all deaths of children worldwide (UNICEF, 2006), and is manifested in various forms, such as, stunting, underweight, muscle wasting, growth retardation, diminished subcutaneous fat, ill health, diseases and high mortality rate.

The early childhood age is a stage of life when the body tissues and cells are growing rapidly. Thus, proper nutrition is required at this time to help children grow physically, mentally, socially and otherwise. Malnutrition at this stage can pose serious threats to the intellectual development, health and academic performance of a child. Sekumade (2013) reported that physical growth and cognitive development in children are faster during the early years of life and that by the age of four, 50% of the adult intellectual capacity has been attained. It is therefore very crucial to carry out nutritional assessment of children, to determine their nutritional status and associated health problems. This will assist in planning intervention programmes that will help reduce malnutrition and associated health problems, thus promote good health and reduce childhood mortality. This is also considered very important because according to the Millennium Development Goals (MDGs), progress towards reducing maternal and child mortality will provide a significant boost to the success of the global poverty reduction agenda.

Nutritional status refers to the nutritional health of a person as determined by anthropometric measures (e.g. height, weight, circumferences), biochemical measurements of nutrients or their by-products in blood and urine, clinical (physical) examination, dietary analysis and environmental, economic evaluation (Byrd-Bredbenner, Moe, Beshgetoor and Berning, 2013; Wardlaw, Hampl,

& DiSilvestro, 2007). Assessing the nutritional status of children is considered very important as it gives a clue to the nutritional status of the entire population. A number of variables can influence the nutritional status of children and hence influence their growth and development. It is possible that such factors as family size, (number of siblings), educational level and other socio-demographic characteristics of parents can impact positively or negatively on the provision of adequate diet that can meet the nutrient needs of children.

In Nigeria, surveys have reported prevalence of malnutrition in children at various locations. Onimawo, Ukaegbu and Abaoja (2007) reported high incidence of stunting, wasting, and underweight among rural pre-school children in Umuahia, Abia State. Similarly, Onyemaobi, Lemchi, Okere, Ihediohanma and Ijioma (2010) reported that stunting (51.83%) and wasting (25.9%) were significantly high among rural school age children in Imo State. Furthermore, Ene-Obong and Ekweagwu (2012) reported 23.3% underweight and 42.5% stunting among rural school age children in Ebonyi State. All the above indicate high incidence of under-nutrition.

Under-nutrition predisposes children to greater risk for diseases such as pneumonia and diarrhea among many others. On the contrary, in the urban areas some of the children may be found to be overweight from over-nutrition. This also has its own disadvantage as it predisposes individuals to health problems such as obesity and diabetes and some forms of cancer among others (Wardlaw, Hampl and Disilvestro, 2007; Byrd-Bredbenner *et.al.,* 2013). Determining the prevalence of under-nutrition, or over-nutrition among a population is therefore considered very important as a basis for planning appropriate intervention programmes.

Various parameters for assessing nutritional status abound. These are generally summarized by the mnemonics "ABCDE", with A = anthropometric assessment, B = biochemical tests, C = clinical indicators, D = dietary assessment and E = environmental/economic status. Anthropometric assessment includes measurement of some physical parameters such as weight, height, total skin fold thickness and arm circumference while dietary assessment involves monitoring food intake of respondents over a specified period of time. These are then compared with recommended dietary standards. Wardlaw, Hampl and Disilvestro (2007) noted that anthropometric measurements are excellent first line of attack in determining nutritional status. They are easy to obtain and are generally reliable. Dietary assessment is also a good approach to identifying nutrients that are likely to be either under, or over consumed by an individual, and used for determining Protein-Energy Malnutrition (PEM). Onimawo (2001) noted that PEM is the most important form of malnutrition for under fives in Nigeria. This study thus combined the anthropometric, dietary assessment and environmental/economic assessment methods to determine the nutritional status of pre-school children (3-5yrs) in urban and rural areas of Owerri North, Imo State, Nigeria.

1.1. Purpose of the Study

The main purpose of this study was to assess the nutritional status of pre-school children in rural and urban areas of Owerri North, Imo State.

Specifically, the study was designed to;

i. Compare the anthropometric measurements of the pre-school children in rural and urban areas of Owerri North (height for age, weight-for-age, and weight for height).
ii. assess the nutrient intake of the rural and urban pre-school children, and
iii. Compare the socio-demographic status of the rural and urban pre-school children.

1.2. Hypotheses

The study tested the following hypotheses at 0.05 level of significance:

- Ho_1: There is no significant difference in the mean height of rural and urban pre-school children in Owerri North.
- Ho_2: There is no significant difference in the mean weight of rural and urban pre-school children in Owerri North.

2. Methodology

2.1. Design of the Study

The study was a descriptive cross-sectional survey involving pre-school children in rural and urban areas of Owerri North LGA, Imo State, Nigeria.

2.2. Population for the Study

The study population consisted of pre-school children in public schools in both rural and urban areas of Owerri North. The population consisted of 6,443 pre-school children, made up of 2,930 males and 3,513 females.

Source: Imo State Universal Basic Education Board (IMSUBEB) (2014).

2.3. Sample for the Study

The sample for the study was made up of two hundred (200) pre-school children selected from four schools (two from urban and two from rural areas) in Owerri North. The schools were selected by balloting. Fifty (50) children were randomly selected from each school, to give a total of 200 children used for the study.

2.4. Instrument for Data Collection

Three sets of instrument were used for data collection. The first set include measuring equipment such as weighing scale, calibrated meter rule, and Anthropometric chart with columns for age, sex, height, weight and Body Mass Index Values. Secondly, the dietary intake chart comprised foods, snacks and beverages, quantity given, quantity leftover and total intake, and was used to collect dietary data. Lastly, questionnaires were designed to collect data on the socio-demographic status of the children such as their family size, the educational level, occupation and monthly income of their mothers.

2.5. Method of Data Collection

2.5.1. Anthropometric Measurements

The weight of each child was measured using a bathroom scale (HANA Model) with the children wearing only light clothing without shoes. Their heights were measured to the nearest 0.5cm using a calibrated meter rule placed on a flat surface. Each child stood erect, without shoes, with eyes looking horizontally and feet together. The BMI of each child was derived using the formula:

$$BMI = \frac{\text{Body weight (kg)}}{\text{Height } (m^2)}$$

2.5.2. Dietary Intake Measurement

This was measured using 24 hour dietary recall and weighing record. The researchers visited the schools during lunch time and recorded the type and quantity of food consumed by the children using food scale. Structured questionnaire was given to the mother of each child for the 24 hour dietary recall of their children. The total/actual intake (TI) was obtained thus; TI = Quantity given – Quantity left over (g).

2.5.3. Socio-Demographic Characteristics

Information about the socio-demographic characteristics of the children including their family size, mother's occupation, education level and monthly income were obtained from the questionnaire administered to their mothers.

2.6. Methods of Data Analysis

Descriptive statistics were used for data analysis. Stunting, underweight and wasting indicators were used to evaluate the nutritional status of the children. Height and weight measurements obtained were compared with WHO reference values. Energy, Carbohydrate, Protein, Iron, Calcium, Vitamin A, Vitamin C and Fat intakes were calculated from Food Composition Table for dietary assessment and compared with Food and Nutrition Board standards of the National Academy of Sciences. t-test was used to determine the difference ($P<0.05$) between the mean height and weight of the urban and rural pre-school children.

3. Summary of Results

The following findings were made by the study;

1) The urban children had slightly higher mean height and weight at all the ages when compared with the rural children (Table 1).
2) The anthropometric indices show that only a small proportion of the urban children were stunted (5%) and wasted (2%), compared with 11% of the rural children that were severely stunted, 6% severely underweight, and 17% severely wasted (Table 2).
3) Energy, Iron and Vitamin A intakes of the children (both urban and rural) were below the RDA for 3-5 years old children (Food and Nutrition Board Standards). However, Carbohydrate and Vitamin C intakes in both urban and rural children were above the RDA. Protein intake was within the RDA range for the urban children, but low in rural children (Tables 3 and 4).
4) There were no significant difference in the mean height and weight of the urban and rural children ($P<0.05$). (Table 5).
5) Socio-demographic data show that the rural children had comparatively larger family sizes, of 7 siblings and even above. Majority of the mothers of the urban children (66%) hold Bachelors or Masters degree, and earned monthly incomes of N50,000 and above compared with those of the rural children who mostly possessed only the lower basic and secondary education and earned very low monthly income (Fig. 1, 2 & 3).

	URBAN						**RURAL**					
Age (Years)	Mean Height(m)		Mean Weight(kg)		BMI(kg/m)		Mean Height(m)		Mean Weight(kg)		BMI(kg/m)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
3.	1.0 (±0.05)	1.0 (±0.52)	12.0 (±1.47)	11.6 (±1.74)	13.6 (±1.26)	12.6 (±2.33)	0.9 (±0.06)	0.9 (±0.04)	11.6 (±1.15)	11.1 (±1.66)	13.0 (±2.10)	14.0 (±1.17)
4	1.2 (±0.04)	1.1 (±0.04)	14.8 (±1.17)	15.4 (±1.32)	12.0 (±1.09)	12.8 (±1.24)	1.1 (±0.08)	1.1 (±0.06)	14.0 (±2.10)	14.6 (±1.58)	11.5 (±1.58)	12.8 (±1.27)
5	1.2 (±0.05)	1.2 (±0.11)	20.7 (±1.40)	22.1 (±1.07)	15.4 (±0.93)	20.7 (±0.89)	1.1 (±0.05)	1.1 (±0.04)	19.9 (±1.22)	20.2 (±2.08)	15.1 (±1.22)	18.8 (±1.71)

Table 1: Anthropometric Characteristics of the Pre-School Children
Source: Field work, 2014

Table 1 shows that the urban children had slightly higher mean height and weight at all the ages compared with the rural children.

Nutritional Status	URBAN						RURAL					
	Male		Female		Total		Male		Female		Total	
	F	%	F	%	F	%	F	%	F	%	F	%
Stunting (Height-for-age)												
Normal	39	81	42	81	81	81	33	73	43	78	76	76
Moderate	6	6	8	15	14	14	17	16	6	11	13	13
Severe	3	3	2	4	5	5	5	11	6	11	11	11
Total	**48**	**100**	**52**	**100**	**100**	**100**	**45**	**100**	**55**	**100**	**100**	**100**
Underweight (Weight-for-age)												
Normal	40	83	42	81	82	82	31	69	42	76	73	73
Moderate	8	17	9	17	17	17	11	24	10	18	21	21
Severe	-	-	1	2	1	1	3	7	3	6	6	6
Total	**48**	**100**	**52**	**100**	**100**	**100**	**45**	**100**	**55**	**100**	**100**	**100**
Wasting (Weight-for-Height)												
Normal	43	90	48	92	91	91	29	64	30	55	59	59
Moderate	3	6	4	8	7	7	13	29	11	20	24	24
Severe	2	4	-	-	2	2	3	7	14	25	17	17
Total	**48**	**100**	**52**	**100**	**100**	**100**	**45**	**100**	**55**	**100**	**100**	**100**

Table 2: Nutritional status of urban and rural children compared with WHO Standards using anthropometric indicators
Source: Field work, 2014

Table 2 above shows that only a small proportion of the urban children were stunted (5%) and wasted (2%). However, 11% of the rural children were severely stunted, 6% severely underweight, and 17% severely wasted.

Food	F	Total Intake	Mean Intake	Energy	Carbohydrate	Protein	Fat	Iron	Calcium	Vitamin A	Vitamin C
Rice	41	9000	219.5	243.1	50.7	2.1	2.3	0.9	22.5	0	0
Yam	13	2499	213.3	214.5	51.6	1.0	0	0.9	27.1	0	15.3
Indomie	8	648	81.0	201	37.8	1.0	0.5	0.5	4.2	0	0
Beans	11	1200	109.1	143.8	15.5	3.0	0.6	2.2	25.0	3.0	2.8
Magarine	5	100	20.0	170	0	0	8.6	0	1.4	200.2	0
Beef	6	270	45.0	94.6	3.6	6.0	3.2	2.7	6.6	56.0	6.1
Fish	25	900	36.0	82.0	2.9	5.1	5.0	0.4	25.5	2.9	0
Milk	9	480	53.3	36.7	2.4	2.0	2.2	0	81.4	39.9	0.5
V.Yogurt	3	350	166.7	99.1	16.2	2.0	1.4	0.2	209.6	13.2	1
Pumpkin leaf	4	140	35.0	6.9	1.7	0.1	0	0.2	6.2	37.9	1.6
Biscuit	29	1450	50.0	169.0	25.0	1.1	5.4	0.1	93.9	18.3	0.2
Pineapple	90	1320	146.6	87.0	24.1	0.1	0	0.4	20.6	5.89	13.8
Total		18,258	1139.91	1447.7	231.4	23.5	29.2	8.18	524.0	377.29	41.3

Table 3: Mean nutrient intake for the Urban Children by the weighing record
Source: Field work, 2014

Table 3 above shows that the Energy, Calcium, Iron and Vitamin A intakes of the urban children were below the Recommended Dietary Allowance (RDA) (1447.7, 524.0, 8.18 and 377.29 respectively) for 3-5 year old children by the Food and Nutrition Board Standards (2011). Carbohydrate and Vitamin C intakes were above the RDA (231.4 and 41.3), while Protein was within the RDA range.

Food	F	Total Intake	Mean Intake	Energy	Carbohydrate	Protein	Fat	Iron	Calcium	Vitamin A	Vitamin C
Rice	38	8000	210.5	243.3	48.6	1.2	2.2	0.7	21.6	0	0
Yam	11	2450	22.7	258.7	62.2	1.7	0	1.1	32.8	0	21.9
Indomie	4	400	100.0	120	12.3	0.3	0.1	0.1	1.3	0	0
Beans	14	1650	117.9	155.4	18.7	3.5	0.7	2.5	27.0	3.5	3.1
Magarine	1	20	20.0	70.0	0	0	8.6	0	1.4	200.2	0
Beef	2	70	35.0	73.5	2.7	4.8	2.8	2.1	4.5	46.1	5.6
Fish	20	550	27.5	62.9	2.2	3.1	3.7	0.2	19.2	2.2	0
Milk	5	150	30	20.7	1.4	1.1	1.2	0.0	40.2	16.8	0.2
V.Yogurt	1	100	100	84.9	13.9	1.2	1.2	0.1	181	10.9	0.9
Pumpkin leaf	1	40	40	7.8	2	0.2	0	0.3	6.9	41.3	1.9
Biscuit	18	900	50	169.0	25	1.2	5.4	0.1	93.9	18.3	0.2
Pineapple	1	150	150	89.0	26.5	0.1	0	0.4	21.1	6.0	14.0
Total		14,480	903.6	1355.2	224.5	18.4	25.9	7.6	450.9	345.3	47.8

Table 4: Mean Nutrient intake for the Rural Children by the weighing record.
Source: Field work, 2014

Results in Table 4 above also show that the Energy, Protein, Calcium, Iron and Vitamin A intakes of the rural children were below the RDA for the 3-5 year olds, while Carbohydrate and Vitamin C intakes were above the RDA.

	Urban	**Rural**	**t-value**
Height (m)	1.1±5.8882	1.1±5.8727	0.6374
Weight (kg)	16.0±1.4258	15.9±1.4920	0.8315

Table 5: t-test analysis of mean height and weight of the Urban and Rural Children

The results of the t-test analysis in Table 5 above, show that the mean height and weight of the urban pre-school children were not significantly different ($P<0.05$) from that of the rural children. Thus, the two null hypotheses that there were no significant difference in the mean height and weight of the urban and rural children were upheld.

→ Socio-Demographic Characteristics of the Pre-School Children

3.1. Family Size (Number of Siblings)

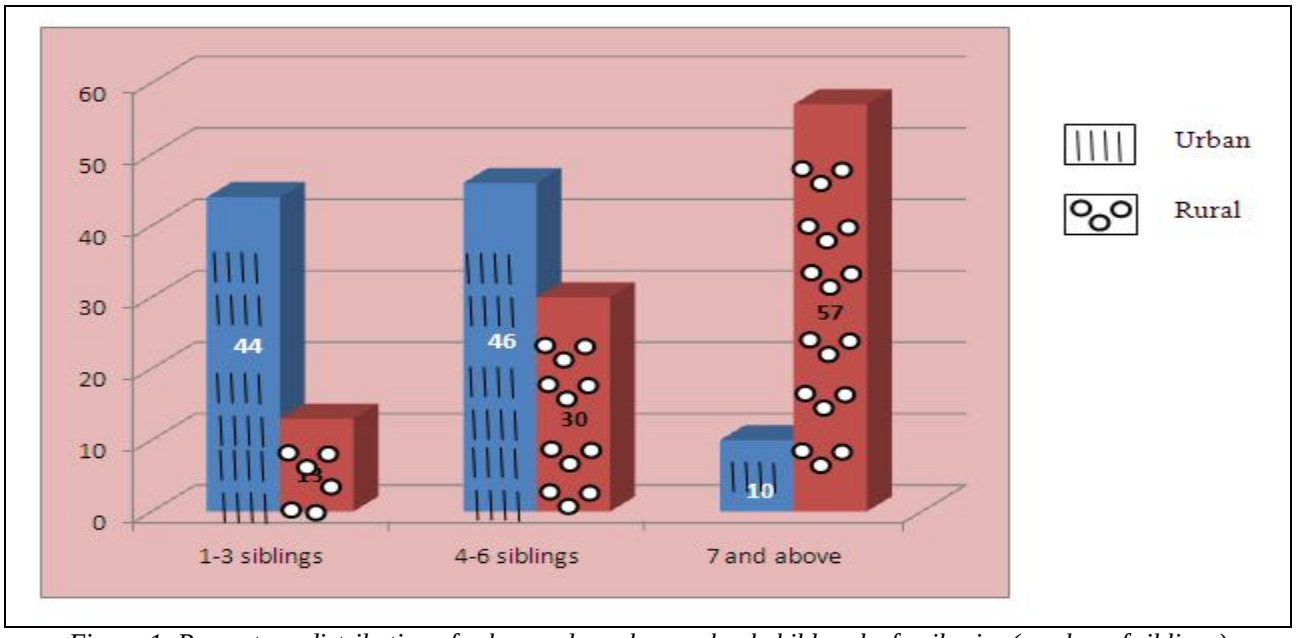

Figure 1: Percentage distribution of urban and rural pre-school children by family size (number of siblings)

3.2. Educational Level

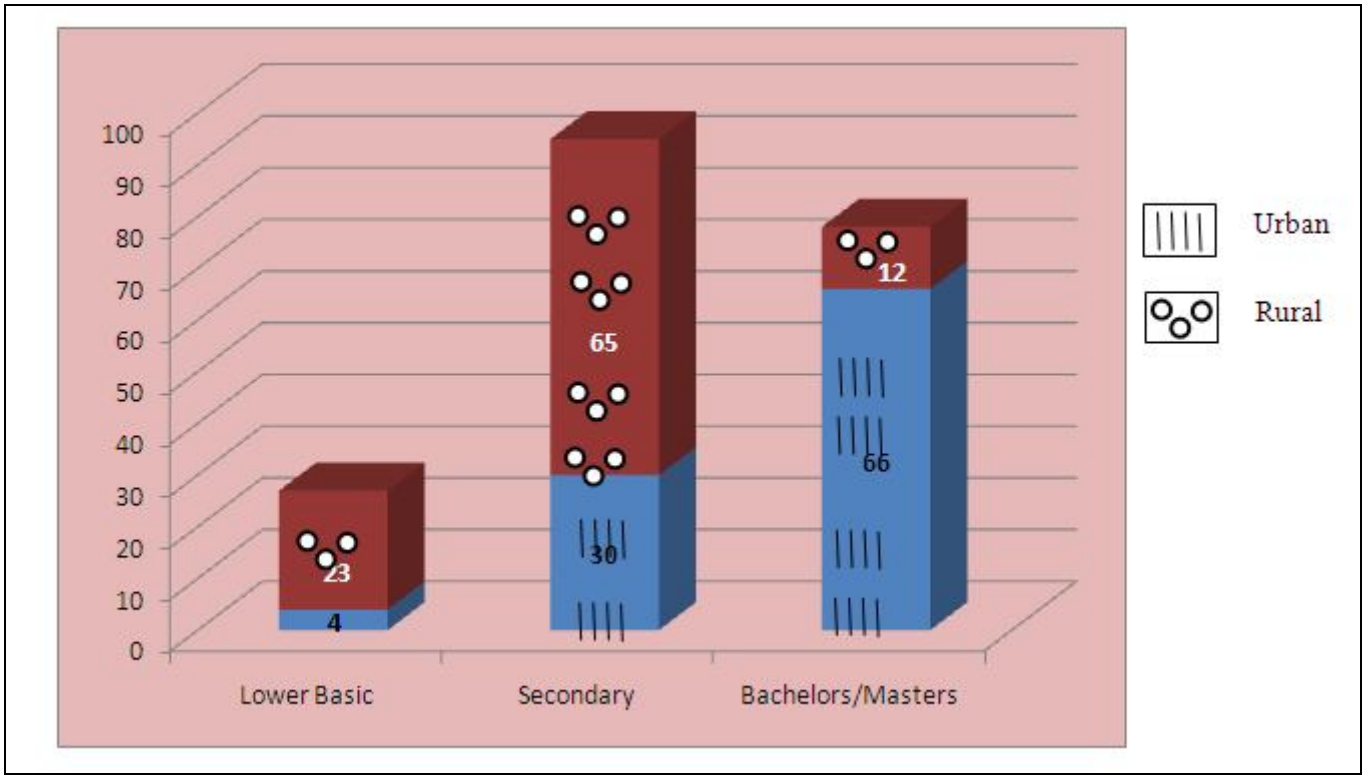

Figure 2: Percentage distribution of the urban and rural pre-school children by educational level of mothers

3.3. Monthly Income (Naira)

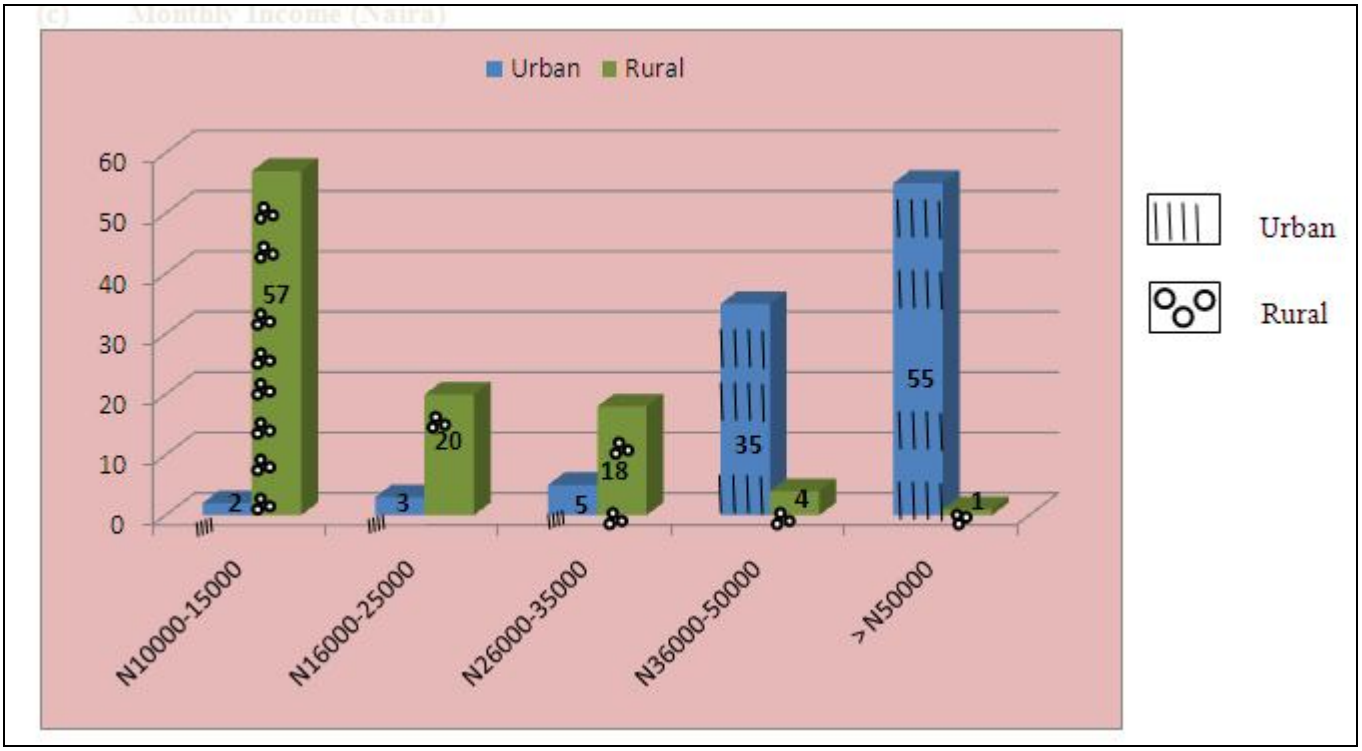

Figure3: Percentage distribution of urban and rural pre-school children by average monthly income of mothers

Figure 1, 2 and 3 show that the urban children had smaller family sizes that range from 1-3 and 4-6 siblings (44% and 46% respectively) whereas the rural children had larger family sizes of 7 siblings and even above. The results also showed that many of the

mothers of the urban children were teachers and civil servants (54% and 29%) while majority of the mothers of the rural children were farmers and traders (50% and 34% respectively). Results in the Table furthermore showed that majority of the mothers of the urban children held Bachelors degree or Masters (66%) and earned higher income above ₦50,000 monthly, compared with those of the rural children who mostly had only Lower basic and Secondary School education (65%), and earned very low monthly income.

4. Discussion

Determining the nutritional status of growing children is very important because malnutrition affects their physical growth, cognitive development and mortality rate. A number of variables are known to influence the nutritional status of children. This study thus combined the anthropometric, dietary assessment and socio-demographic parameters in comparing the nutritional status of pre-school children (3-5 years) in urban and rural areas of Owerri North, Imo State, Nigeria. The results of the anthropometric measurements of the children showed that the urban children had higher mean height and weight values at all ages compared with the rural children. Moreover, the BMI of the female children were generally higher than that of the male children both in the urban and rural children, except at age 3. Similar studies carried out using school aged children (6-11years) found that BMI of the boys in most ages were slightly higher than that of the girls, although the difference was not significant ($P<0.05$) (Lemchi, Nwambekwe, Okeke, Onyemaobi & Ekomaru, 2012).

The low level of malnutrition observed in the urban children in terms of stunting (5%) and wasting (2%) is possible due to the fact that most of the mothers of the urban children were better educated and earned higher monthly income than those of the rural children, and thus may be more informed and able to provide more adequate nutrition for their children and attain higher nutritional status. This finding is consistent with the survey by Oninla, Owa, Onayade and Taiwo (2007) in their comparative study of nutritional status of urban and rural children in Nigeria. The level of severe stunting (11%), underweight (6%) and wasting (17%) observed in the rural children in this study were remarkably lower than the findings of Ene-Obong and Ekweagwu (2012) where 42.5% and 23.3% of the children were stunted and under-weight respectively. Similarly, the levels of stunting and wasting found in this study are relati vely lower than the levels reported by Onyemaobi et. al. (2010) who found 51.83% stunting, and 25.9% wasting among rural school age children in Imo State. Furthermore, Onimawo et. al. (2007), similarly reported high prevalence of stunting, wasting and underweight among rural pre-school children in Abia State.

This seemingly improved nutritional status observed in the present study could be attributed to various interventions and awareness campaigns that have been carried out since after the previous studies. It is possible that this has impacted on mothers positively and enhanced their capacity towards providing more adequate nutrition for their children.

The observed prevalence of stunting, wasting and under-weight in the rural children is possible due to the fact that hunger and improper selection of food are often more prevalent in the rural areas. The low level of education of mothers of the rural children, coupled with low income level often translates to reduced access to food and adequate diet in particular, and thus inadequate food intake and resultant under nutrition. Stunting and wasting are indicators of malnutrition, which is the underlying cause of a substantial proportion of childhood deaths. Furthermore, stunting and wasting at this pre-school age may be a reflection of carry-over of malnutrition from the first year of life, thus, stressing the need for mothers to be nutritionally informed. This is because there are actually good and cheap sources of food in the rural areas that can be combined to attain adequate diet that meets the nutrient needs of the children.

The dietary assessment showed that Energy, Iron and Vitamin A intakes of the children (both urban and rural) were below the RDA for their age according to the Food and Nutrition Board Standards (2007). This is consistent with the findings of the survey by Onimawo et. al. (2007) which recorded low levels of Iron, Vitamin A and Calcium in both groups of children. However, while the level of Protein intake was within the RDA range for the urban children and low for the rural children in the present study, Onimawo et. al. recorded low Protein intake for both groups (urban and rural). The Energy intake of the urban children were higher than that of the rural children (1447.7kcal vs 1355.2kcal). The food consumption pattern assessed using 24 hour recall showed that rice was the staple food consumed by the children in both areas. Others include garri, yam, beans and pap. The main sources of protein for the urban children were milk, fish and meat (85%, 84% and 81% respectively), while beans, beef and fish (77%, 71% and 69%) were the sources of protein for the rural children. Also, the urban children consumed more milk (85%) than the rural children. The dietary assessment showed that in both groups, carbohydrate contributed a larger percent to the total energy intake. This is not surprising because root, tubers and legumes are the most abundant and cheap staple food available in Nigeria. Vitamin C intake of the rural children (47.8mg) was higher than that of the urban children (41.3mg). This implies that the rural children consumed more fruits and vegetables, (which are incidentally more accessible in rural areas) than the urban children. However, the Vitamin C intake of both groups is higher than the RDA for their age. The higher calcium intake of the urban group (524.0mg) could be attributed to their higher consumption of foods of animal origin.

Socio-demographically, the nutritional status of the urban children were better than that of the rural children in the present study. This can be attributed to a lot of factors including the fact that the rural group had comparatively large family sizes of 7 siblings and even above, coupled with the fact that most of their mothers had low level of education and earn quite low income monthly and as such cannot adequately provide the basic nutrient needs of their children. Byrd-Bredbenner *et.al.* (2013) rightly noted that people with inadequate education, income and poor housing often have greater risk of poor health. Limited education may also tend to reduced ability to follow instructions given by health-care providers. Moreover, large family sizes most often reduce the amount of food available to individuals and the resultant over-crowding encourages spread of diseases. These may consequently lead to malnutrition and poor health. Comparatively, the majority (66%) of the mothers of the urban children had Bachelors degree and above, thus were

more educated and earned more income, and as such are in a better position to provide the basic nutrient needs of their children to achieve desirable nutrition.

5. Conclusion

Obviously, the children from the urban area in this study had more adequate nutrition than their rural counterparts. However, despite the low prevalence of underweight and malnutrition in the urban children, there is need for nutrition education programmes for the mothers, as the Energy, Iron and Vitamin A intakes of the children were below the RDA for both urban and rural children. This need for nutrition education is however more imperative for the mothers of the rural children where the cases of stunting, underweight and wasting were more prevalent.

6. Recommendations

Based on the findings of the study, the following recommendations were made;

i. More efforts should be geared towards improving the nutritional status of school children through the effective implementation of the school lunch feeding programme in the country.
ii. Home Economists and Nutritionists should step up nutrition education advocacy and campaigns to sensitize mothers towards appropriate selection of foods to ensure adequate nutrition of children and optimization of nutrients.
iii. Nutrition education should also enable mothers and caregivers understand the basic needs and nutrient requirements of children for optimal growth and development, as well as sources of these nutrients.
iv. Advocacy for fortification of food with the essential micronutrients should be stepped up to assist in meeting the children requirements of these micronutrients in their diet for healthy development.

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