

*Full Length Research Paper*

# Nutritional status of preschool children aged 2 - 5 years in Aguata L.G.A of Anambra State, Nigeria

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A lot of reports show that there exist problem of malnutrition among Nigerian children. This study has been designed to assess the nutritional status of preschool children aged 2 - 5 years in Aguata L.G.A of Anambra State, Nigeria. The study was carried out using anthropometric measurements (weights and heights) and 3 day weighed food intake methods. Two hundred and eight preschool children were randomly selected from two (2) towns in Aguata. A sub sample of 20 children was randomly selected for the 3 day weighed food intake study. The mean weights and heights of the children ranged from  $11.6 \pm 2.19$  to  $19.3 \pm 1.84$  kg and  $85.7 \pm 7.61$  to  $111.6 \pm 3.99$  cm, respectively. Using NCHS (1976), Standard of reference, 7.7, 7.7 and 2.4% of the children were wasted, stunted and underweight, respectively. The daily energy intake of the children ranged between 51.2 and 62.9% of their energy requirement daily. Their daily protein, iron, calcium, and B-complex vitamin intakes were generally poor while that of vitamin A was above requirement values. However, most of their foods were of plant source whose nutrients are poorly bioavailable. Therefore, application of improved food processing and storage techniques, dietary diversification and fortification with intensified nutrition education would reduce malnutrition in the area.

**Key words:** Nutritional status, stunting, wasting, nutrient intake, preschool.

## INTRODUCTION

Worldwide, adequate nutrition is being increasingly emphasized as a human right. The nutrition of preschool children is of considerable importance not only because of concern over their nutrition in formative stage of life but is widely perceived to have a substantial and persistent impact on their physical and mental development and on their health status and productivity as adults (Scrimshaw, 2001).

Childhood malnutrition is characterized by growth failure. Anthropometric measurements especially that of children is particularly important in assessing their nutritional status. According to Dawson (1992), heights and weights of children, particularly those less than 5 or 6 years of age, and pregnant/lactating women, are accepted measures for monitoring their growth and nutritional status, and are also considered as an indicator of the nutritional status of the entire community. Three indicators

indicators used for classification by comparison with a reference population (NCHS/ WHO International growth reference) are: weight for height; weight for age and height for age.

Wasting refers to a low weight – for – height that is below 2SD of the median value of the NCHS/WHO International weight – for – height reference. A prevalence of wasting or acute malnutrition between 5 – 8% indicates a worrying nutritional situation and prevalence greater than 10% corresponds to a serious nutritional situation (SCN, 1995). Underweight is defined as low weight for age at below 2SD of the median value of the NCHS/WHO International reference for weight for age. Stunting refers to shortness that is a deficit or linear growth that has failed to reach genetic potential. It is defined as low height for age at below 2SD of the median value of the NCHS/WHO International growth reference.

A lot of reports show that there exist problem of malnutrition among Nigerian children. Report by WHO (2000), showed that 37.7% and 39.1% of preschool children are stunted and underweight, respectively, in Nigeria. According to National micronutrient survey (1993),

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**Table 1.** Mean weights, heights and BMI of the 2 - 5 year old children.

Age (yrs)	No	Sex	Mean weights (kg) ( $\pm$ S.D)	Mean heights (cm) ( $\pm$ S.D)	Mean BMI ( $\pm$ S.D) kg/M <sup>2</sup>
2	4	M	14.2(5 $\pm$ 1.71)	88.75( $\pm$ 5.80)	18.06( $\pm$ 0.62)
2	5	F	11.6( $\pm$ 2.19)	85.7( $\pm$ 7.61)	15.73( $\pm$ 1.26)
3	4	M	13.75( $\pm$ 1.71)	97.75( $\pm$ 1.89)	14.36( $\pm$ 1.19)
3	15	F	13.57( $\pm$ 0.86)	91.7( $\pm$ 2.78)	15.91( $\pm$ 1.51)
4	44	M	16.90( $\pm$ 1.44)	102.71( $\pm$ 4.54)	16.05( $\pm$ 1.33)
4	28	F	15.91( $\pm$ 1.48)	102.04( $\pm$ 5.09)	15.36( $\pm$ 1.78)
5	48	M	19.30( $\pm$ 1.84)	111.55( $\pm$ 4.98)	15.54( $\pm$ 1.38)
5	60	F	18.77( $\pm$ 1.82)	111.6( $\pm$ 3.99)	15.07( $\pm$ 1.22)
Total	208				

report, there exist problem of stunting (24%) and wasting (22%) in South Eastern Nigeria. This study outstandingly aims at assessing the nutritional status of preschool children aged 2 - 5 years in Aguata L.G.A, Anambra State, Nigeria.

### Study area

Anambra State covers an area of 4,416sqKm, has tropical rain forest vegetation, humid climate with population of 4,055,048 people, according to 2006 census. Aguata is one of the rural parts of Anambra with population close to 800,000 people. Their major occupation is farming at peasant level.

### MATERIALS AND METHODS

This study was carried out in two towns, Ezinifite and Uga in Aguata L.G.A of Anambra State. The study was done using anthropometric measurements (weight and height) and 3 day weighed food intake study. Multistage sampling was employed in selection. From about ten nursery schools in the area, five were randomly selected. The sampling frame from each school was used to calculate an interval for selecting 40 children using systematic sampling. Two hundred and eight (208) preschool children were involved in anthropometric measurements. A sub-sample of 20 children (13 females and 7males), representing about 10% of the sample size, were involved in 3 day weighed food intake study. These 20 were randomly selected with due replacement of those that failed to cooperate.

#### Weight measurement

Using Salter scale (1 - 120 Kg cap., CAMRY), subjects were made to stand on the platform without touching anything. Shoes and heavy clothing were removed. Readings were taken to the nearest 0.1Kg. Weighing was not done after a full meal or when the stomach was virtually empty.

#### Height measurement

The children were made to stand without shoes on the horizontal platform of the height metre rule (the microtoise Height measure CMS Weights Ltd, London). With their feet parallel, their heels,

buttocks, shoulders and back of head were made to touch the upright part of the metre. The head was held comfortably erect in the same horizontal plane as the external auditory meatus. The arms hung at the sides in a natural manner. The head piece was then lowered gently, crushing the hair and making contact with the top of the head. Readings were taken to the nearest 0.5 cm.

#### Weighed food intake

All raw ingredients and empty pot(s) used in preparing the meals taken by the subjects were weighed and the weights recorded. Total cooked weight and proportion of the food taken by the subject were noted. The weights of food wastes from the children's plates were noted. Using simple proportion, the amount of each ingredient consumed by each subject was calculated.

#### Analysis

Data from anthropometric measurements were analysed using NCHS (1976), standard of reference. The indicators of nutritional status used were weight for height, weight for age, height for age Z-scores. By the use of the above indicators' Z-scores results, percentages of stunted, wasted, underweight and normal children were calculated. The mean and standard deviation of the height and weight measurements were done using Statistical Package for the Social Sciences (SPSS). Food composition tables (Platt, 1975; FAO, 1968) were used to calculate the energy/nutrient composition of the amount of ingredients consumed by the subjects. The results were then compared with the requirement values.

### RESULTS

Table 1 shows that mean weights and heights of the children ranged from 11.6  $\pm$  2.19 to 19.3  $\pm$  1.84kg and 85.7  $\pm$  7.61 to 111.6  $\pm$  3.99 cm, respectively. Using weight for height parameter, 50% of 2 years male children had normal weight for height while 50% were overweight (Table 2). Among 3-year-old children, 50% male subjects were wasted. Five-year-old children had 83.3% and 95%, male and female subjects normal, respectively (Table 2). Table 3 shows that 50, 100, 75 and 81.3% of male children of ages 2, 3, 4 and 5 years respectively shows 60, 93, 85.7 and 81.7% normal height for age, accordingly. Twenty (20%) percent of Two-year-female children were stunted. Weight for age parameter shows that 2.1% of 5-year-

**Table 2.** Percentage of children with normal weight for height (W/H), overweight and low weight for height.

Age (yrs)	Male				Female			
	Normal +1SD, -1SD	Over weight +2SD	Wasted -2SD	Total	Normal +1SD, -1SD	Overweight +2SD	Wasted -2SD	Total
2	50(2)	50(2)	0(0)	100	80(4)	0(0)	20 (1)	100
3	50(2)	0(0)	50(2)	100	86.7(13)	0(0)	13.3 (2)	100
4	84.09(37)	11.3(65)	4.55(2)	100	85.7(24)	3.6(1)	10.7 (3)	100
5	83.3(40)	8.3(4)	8.3(4)	100	95(57)	1.7(1)	3.3(2)	100

N.B: Numbers in brackets represent number of subjects with each indicated percentage.

- 1SD to + 1SD Normal; -2SD wasting; + 2SD over weight.

Source: NCHS, (1976).

**Table 3.** Table 3 caption 'Percentage of children with normal height for age, above normal height for age (tall) and low height for age (stunted).

Age (yrs)	Male				Female			
	Normal +1SD, -1SD	Above normal (tall) +2SD	Stunted<-1SD	Total	Normal +1SD, -1SD	Above normal (tall) +2SD	Stunted <-1SD	Total
2	50(2)	50(2)	0(0)	100	60(3)	20(1)	20 (1)	100
3	100 (4)	0(0)	0(0))	100	93.3(14)	0(0)	6.7(1)	100
4	75 (33)	6.82(3)	18.18(8)	100	85.7(24)	3.6(1)	10.7 (3)	100
5	81.25(39)	12.5(6)	6.25(3)	100	81.7(49)	18.3(11)	0(0)	100

N.B: Numbers in brackets represent number of subjects with the indicated percentages.

- 1SD to + 1SD Normal; -2S stunting; + 2SD above normal.

Source: NCHS, (1976).

**Table 4.** Percentage of children with normal weight for age, above normal weight for age (overweight) and low weight for age.

Age (yrs)	Male				Female			
	Normal +1SD, -1SD	Over weight +2SD	Under weight -2SD	Total	Normal +1SD, -1SD	Overweight +2SD	Under weight -2SD	Total
2	50(2)	50(2)	0(0)	100	80(4)	0(0)	20 (1)	100
3	50(2)	0(0)	50(2)	100	100 (15)	0(0)	0(0)	100
4	97.73 (43)	2.27(1)	0(0)	100	96.4(27)	0(0)	3.6(1)	100
5	95.8(46)	2.1(1)	2.1(1)	100	93.3(56)	6.7(4)	0(0)	100

N.B: Numbers in brackets represent number of subjects with the given percentages.

- 1SD to + 1SD Normal; -2SD under weight; + 2SD Over weight.

Source: (NCHS, 1976)

male children were underweight. Twenty percent (20%) and 3.6% of 2 years and 4 years female children were also underweight, respectively. The result also shows that 95.8 and 93.3% of 5- years-male and female children respectively had normal weight for age, (Table 4). In general, 7.7%, of the children were wasted, while 7.7% of them were stunted and 2.4% were underweight (Table 5). Table 6 shows that 2 - 5 year old children took between 51.2 and 62.9% of their energy requirement daily. Their daily vitamin A intake was above the requirement but their daily calcium, thiamin, riboflavin and niacin intakes were below requirement values for their age ranges. Daily mean protein intake of the children ( $13.33 \pm 2.29$ ;  $14.20 \pm 4.08$ ;  $17.19 \pm 4.79$ ) for 2, 4, and 5 year old

children respectively, were generally below requirement except for

3 year old children ( $15.64 \pm 6.29$ ). Also the percentage daily iron intake of the children ranged from 84% in the 2 year group to 101% in the 4 year age group. higher than that of their female counterparts in each age group except in 5 year old children where their mean heights appeared to be equal. But generally, as it was in NMS (1993), male subjects were far much more affected by nutritional deprivation than their female counterparts. This situation is in contrast with what many researchers have reported in the past in most African regions where

**Table 5.** Percentage of children classified as normal, above normal, and wasted/stunted/underweight as judged by weight for height, height for age and weight for age parameters.

Indicators	Normal +1SD, -1SD	Wasted - 2SD	Stunted - 2SD	Under weight -2SD	Above normal + 2SD	Total
Weight for height	86.06 (179)	7.69 (16)	-	-	6.25 (13)	100 (208)
Height for age	80.77 (168)	-	7.69 (16)	-	11.54(24)	100 (208)
Weight for age	93.75 (195)	-	-	2.40 (5)	3.85(8)	100 (208)

NB: The numbers in brackets represent the number of subjects with the indicated percentages.

**Table 6.** Mean daily energy and nutrient intake of the 2 - 5 year old children compared with FAO/WHO/UNU requirement values.

Nutrients/Age	Age (yrs)	Energy (Kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (gRE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic Acid (mg)	ZINC (mg)
Mean daily intake	2	784.63 ± 194.71	13.33 ± 2.29	236.99 ± 94.14	7.13 ± 1.40	683.35 ± 131.26	0.48 ± 0.09	0.26 ± 0.08	4.14 ± 0.77	24.11 ± 8.37	6.67 ± 2.94
FAO/WHO/UNU requirement values		1250	14.5	450	8.5	400	0.5	0.8	8.6	20	5.5
% Intake of requirement		62.77	91.93	52.66	83.88	170.84	96	32.5	48.14	120.55	121.27
Mean daily intake	3	670.82 ± 130.14	15.64 ± 6.29	181.16 ± 69.23	7.77 ± 1.76	637.77 ± 100.96	0.45 ± 0.06	0.29 ± 0.10	4.13 ± 0.67	19.16 ± 11.75	7.00 ± 2.36
FAO/WHO/UNU requirement values		1250	14.5	450	8.5	400	0.5	0.8	8.6	20	5.5
% Intake of requirement		53.67	107.86	40.26	91.41	159.44	90	36.25	48.02	95.8	127.27
Mean daily intake	4	792.92 ± 114.28	14.20 ± 4.08	174.40 ± 25.43	9.05 ± 2.74	753.37 ± 247.94	0.51 ± 0.12	0.30 ± 0.08	4.73 ± 0.64	21.39 ± 0.35	8.13 ± 3.29
FAO/WHO/UNU requirement values		1550	17.5	450	9	400	0.7	1.10	11.20	20	6.5
% Intake of requirement		51.16	81.14	38.76	100.56	188.34	72.86	27.27	42.23	106.95	125.1
Mean daily intake	5	974.66 ± 182.16	17.19 ± 4.79	202.71 ± 60.22	8.7 ± 1.31	864.05 ± 330.88	0.59 ± 0.11	0.34 ± 0.06	7.17 ± 5.85	30.38 ± 12.24	9.29 ± 1.60
FAO/WHO/UNU requirement values		1550	17.5	450	9	400	0.7	1.17	11.20	20	6.5
% Intake of requirement		62.88	98.23	45.05	96.67	216.01	84.29	30.91	64.02	151.90	142.92

Source: Energy and protein requirement. Report of a joint FAO/WHO/UNU Expert consultation. Technical Report Series (724). WHO, Geneva, (1985).

Requirements of ascorbic acid, Vitamin D, Vitamin B<sub>12</sub>, folate and iron. WHO Report No. 452 (1970). Requirements of Vitamin A, iron, folate and Vitamin B12, Report of a joint FAO/WHO Expert consultation. Food and Agriculture Organisation of the United Nations, Rome (1988). Requirements of Vitamin A, thiamin, Riboflavin, WHO Report No 62 (1967) and Calcium requirement FAO/WHO report No. 230 (1962). Zinc requirement, WHO (1996).

male subjects were favoured nutritionally than female ones sometimes due to cultural reasons like gender discrimination. On the whole, 7.7, 7.7 and 2.4% of 2 - 5 year old children in Aguata were wasted, stunted and underweight, respectively. An earlier report by WHO (2000), shows that 37.7% and 39.1% of preschool children in Nigeria are stunted and underweight, respectively. Even though the values presented (7.7 and 2.4%) by our research are smaller than WHO reported values, the children in Aguata are within the category of the malnourished children in Nigeria. Similarly, these values agree with the report of National Micronutrient Survey (NMS, 1993), that there exist problems of stunting (24%) and wasting (22%) in South - Eastern Nigeria which includes Aguata L.G.A, Anambra State. The reason for much reduced percentage of malnourished children in this study may simply be because of collective efforts put towards reducing both micronutrient and macronutrient deficiencies and BFHI programme in Nigeria in the past few years.

Inadequate energy intake was seen in this study. This can be because of consumption of bulky food with low energy and/or nutrient density. The protein intake of the children was generally low but above 81% of their FAO/WHO/UNU daily requirement. Most of their protein intake were from plant foods but there are some nutritionally good food combinations they make in the area that can help in improving the quality of their protein intake. For example, plant foods like beans were being prepared with animal foods like crayfish and/or dried fish and/or meat. At times, legumes and cereals were normally mixed together in their meals and this combination gives protein of very high quality.

Although the iron intake of the children can be said to be fair, most of their iron were of plant source. The problem with iron from plant source is poor bioavailability, since inorganic iron from plants is not well absorbed in the body unless they are taken with ascorbic acid foods or animal foods. The low intake of calcium and B-complex vitamins recorded in this study may be due to the source and type of food eaten. Plant foods are poor sources of calcium compared with milk but they had little or no milk in their diets daily probably due to cost. Animal foods are better sources of the B-complex vitamins though the body, as in the case of niacin, is not entirely dependent on dietary supply since it can be synthesized from tryptophan.

Generally, high intake of vitamins A and C were observed. Fruits, vegetables and palm oil which are known to be very rich sources of these vitamins and their precursors were highly consumed by the subjects, especially when in season. However, the bioavailability of these vitamins may be adversely affected by some wrong handling and/or preparatory processes practiced in the area. These include, reheating of vegetables in meals

severally before consumption, cutting vegetables before washing, exposure of vegetables and fruits to some degree of sun-drying before use.

The children whose nutritional needs were met were normal but those who were malnourished were stunted, wasted and underweight. The solution therefore remains – Intensified nutrition education, dietary diversification and fortification, improved food production, processing, storage and handling techniques.

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