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Nutrient Composition of Traditional Foods and Their Contribution to Energy and Nutrient Intakes of Children and Women in Rural Households in Igbo Culture Area

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Abstract: Micronutrient deficiency, namely: vitamin A, iron, iodine, zinc and burden of chronic diseases are prevalent. Eight communities selected from four States were used for this study. Key informant interviews, focus group discussions, nutrient composition and food intakes were used to ascertain use of local foods by households. Nutrient analysis on food recipes was carried out for all dishes collected from the field survey. Two communities out of the eight were randomly selected for detailed weighed food intake study which was done on a sub-sample to determine contribution of traditional foods. Results revealed that most of the recipes had reasonable energy content, at least over 90% of the energy was contributed to the diet of respondents from traditional foods. Moisture content was high and ranged from 44.3% in bambara fufu to 76% in palm nut soup/sauces. Protein content ranged from 0.2% in dried cassava fufu to 14.6% in plain bambara fufu. The recipes had reasonable nutrient content but were low in the micronutrients that were of public health importance, namely; iron, zinc and folic acid. Intakes of fruits and vegetables were low in these communities. In Anambra State, nuts and seeds made substantial contribution to energy, protein, calcium and iron while in Enugu State, legumes and cereals contributed to energy, protein, calcium and iron intakes. Further more, the bulk of the ascorbic acid came from vegetables in Anambra State (34-62%) while in Enugu State the ascorbic acid came from starchy roots and tubers (51-58%). The red palm oil (RPO) used in preparing many traditional dishes was the major source of vitamin A in the diet of the Igbo culture area. It contributed 70 - 85% of the vitamin A. Although traditional foods/diet made substantial contribution to the nutrient intakes of the populations studied, the results showed that in almost all the age groups low intakes of energy, calcium, riboflavin and niacin were observed. Low intakes were recorded more for children 6 - 12 years of age. Interventions to solve these problems must consider these issues in order to make a significant impact.

Key words: Nutrient composition, traditional foods, percent contribution, children, women

INTRODUCTION

The Igbo culture area may be defined as an area enclosed by an imaginary line running outside of the settlements of Agbor, Kwalle (Onwuejiogwu, 1984). Ahoada, Diobu, Umuaboyi (Port Harcourt), Arochukwu, Afikpo, Isiagu (Abakaliki area), Enugu Ezike (Nsukka area) and Ebu (Onwuejiogwu, 1984). In this area, the Igbos live in patrilineages called "Umunna". The patrilineages which are of variable size and span and of diverse origin federated to become villages. Groups of villages federated to form towns called "Obodo". Permanent Igbo settlements are widely distributed in six ecological areas within the Igbo culture area. These comprise: The southern half of the scarp lands of South Eastern Nigeria, the southern half of the lower Niger Basin, the Midwest Lowland, the Niger Delta, the Palm Belt of South Eastern Nigeria and the Cross River Basin. The Igbos number about 23 million (Ndiokwere, 1988). They have one of the highest population densities in West Africa, ranging from 300 to over 1000 persons per kilometer. They exploit the palm produce on the West African Equatorial forest and cultivate yams (*Dioscorea* spp), cocoyams (*Colocasia spp* and *Xanthosoma maffafa*), maize (*Zea mays*) and cassava (*Manihot spp*).

The Igbo culture area is rich in nutritious food plants. In recent decades, however, social and economic changes have militated against the propagation and use of these nutritious food plants. Food plants are traditional in the sense that they are accepted by rural communities by custom, habit and tradition as appropriate and desirable food. People are used to them; they know how to cultivate and prepare them and enjoy the dishes made from them. They are grown for food within the farming systems operating in any particular locality or gathered as wild or semi-wild products.

There are two groups of foods: Those consumed in the areas where they are grown as traditional dietary staples, for example, cassava, yam, cocoyam, sweet potatoes (*Ipomoea batatas*), plantains (*Musa paradisiaca*) and maize. The second group is made up of those consumed as a component of accompanying relishes and sauces. These include oilseeds, fruits and vegetables. There is no universally accepted short list of such plants. Communities have evolved their own preferences and food habits.

Both protein energy malnutrition and micronutrient deficiencies are devastating public health problems in the Igbo culture area. Key findings for children aged 6-71 months in the Igbo area showed dietary risk of vitamin A deficiency of 16%, serum vitamin A deficiency 15% and iron deficiency 73% (Atinmo, 1993). Reasons for malnutrition are: Poverty, poor hygienic practices, urbanization, poor utilization of traditional food resources, over dependence on highly processed foods, change in lifestyle and intra familial food distribution. However, studies showed that it was not unequal distribution of food within the households that might be the main problem but that the available food supply was simply inadequate (Okeke and Nnanyelugo, 1989). The implication of the study was that all members of the households were not getting enough food to eat and some members, especially the vulnerable ones consumed less than the FAO/WHO requirement values (Okeke and Nnanyelugo, 1989). Most studies done in the country and specifically in the Igbo culture area have not determined the contribution of traditional foods to respondent's food intake, which makes this work unique.

The current chronic or non-communicable diseases are no longer the "disease of the affluent". It is currently emerging both in poorer countries and poorer population groups in the richer countries (Popkin, 2002). It has been projected that by the year 2020 chronic diseases will account for almost three quarters of all deaths and that 71% of death due to ischemic heart disease, 75% of death due to stroke, 75% of death due to diabetics will occur in developing countries (The World Health Organization Press, 1998) As modern dietary pattern has been implicated in the burden of chronic diseases, emphasis should be placed on consumption of healthy traditional foods to reduce the incidence of non-communicable diseases in rural communities. Therefore, this work is aimed at determining the nutrient composition and the contribution of traditional foods to the nutrient intake of women and children in the Igbo culture area.

MATERIALS AND METHODS

Key informants interviews: The Chiefs and the elders of the communities, namely: Aku and Ezinifite in Anambra State; Ede-oballa and Ukehe in Enugu State; Ohiya and Ohuhu in Abia State; Ogbe and Alumu in Ubulu-uku, Delta State were the major informants. They gave the researchers information concerning the structure of each of the villages used for the study. They also guided the researchers on choosing knowledgeable people to be used for focus group discussions and all other information that the researchers required.

Assessment of nutrient composition: Representative samples of each cooked dish during the survey period were collected and placed in sealed food containers and taken to the food analysis laboratory and stored frozen till they were ready for analysis. The samples were homogenized using a Kenwood Chef (Thorn Emi domestic Appliances, Ltd., UK) electric blender after which portions were weighed out into a previously weighed into clean dry petri dish. Drying was done with the electric oven at between 55 and 60°C while moisture was at 105°C. Dried samples were allowed to cool in a dessicator and then ground into powder. Samples of each dried meals were packed in moisture resistant polythene bags with thorough identification and kept frozen until further analysis. Moisture content was calculated as per water loss (Association of Official Analytical Chemists, 1995). Foods were analyzed for their nutrient content using standard assay methods (Association of Official Analytical Chemists, 1995). Protein from plant and animal sources were determined by the micro-Kjeldahl method which determined the amount of nitrogen in the sample, which was subsequently multiplied by a factor of 6.25.

Fat in the samples was determined using Soxhlet extraction apparatus (Model Soxtherm Automatic). Ash in the sample was prepared by igniting a weighed portion of dried sample in a muffle furnace (Model Heraeus, Germany) at 550°C; the residue (ash) was weighed. Crude fiber was determined using Fibertec system (Model Tecator, Gerhardt, Germany).

Total carbohydrate was computed by subtracting the percentage content of moisture, protein, total lipid and ash from 100. Energy of food sample was calculated using the factors of protein x 4, fat x 9 and digestible carbohydrate x 4. Iron, zinc, copper and phosphorus were measured using atomic absorption spectrophotometer (AAS model ISO, 9001). Ascorbic acid and folic acid were measured using high performance liquid chromatography (HPLC, model ISCO U5). Vitamin A (β- carotene) was determined by HPLC. The samples were carefully protected from destruction by air, light, acids and trace minerals by storing them in zip-locked cold polythene bags until they were analyzed.

Weighed food intake: Types of foodstuff, preparation methods and condiments used were noted. All snacks, quantity taken and plate waste were measured on a three-day basis (one weekend day and two weekdays with exclusion of party meals) for each respondent. The research assistant visited the household of the respondents prior to study day to prepare the family for the study. This visit was to enable the assistant to explain the purpose of the study and assure them of confidentiality of the information collected. The assistant visited the household before the preparation of the first meal till the last meal of the day. All meals and snacks eaten between meals were weighed and recorded, using dietary scales calibrated from 1gm-20kg. All food and snacks eaten outside the home were also obtained by 24 hour-recall. Similar quantities were obtained from the mother or bought, weighed and recorded.

Data analysis: The proximate compositions of the foods were as consumed per 100 gram edible portion.
Results of the weighed food intake calculations were presented as percentage of the recommended daily allowances of FAO/WHO/UNU (1985, 1988). Contributions of traditional foods to the nutrient intakes of the children and mothers were calculated.

RESULTS

Nutrient composition: Table 1 showed the proximate, mineral and vitamin composition of recipes as consumed in Igbo culture area. The moisture of these recipes ranged from 44.3% in bambara fufu (Vigna subterrenea) to 76% in palm nut soup. The next highest moisture content was in ogbono (*Irvingia gabonensis*) soup 65%, followed by melon (*Citrillus vulgaris)*, achara (*Pennisetum spp)* and okazi soup (*Gnetum africanum)* which were all comparable (64.8%). The fat content ranged from 0.01% in cassava fufu to 9.41% in melon soup. Protein content of these recipes studied ranged from 0.27% in dried cassava fufu to 14.6% plain okpa. The next highest protein content were in ukwa dish with 12.56% and plain ukwa (*Treculia africana),* 11.9% while bambara fufu had 10.3%. The fibre content ranged from 0.12% in dried cassava fufu to 2.07% in egusi soup (*Citrillus vulgaris).* Nsala soup prepared with fish *(Teterotis niloticus)*, African yam bean (*Sphenostylis stenocarpa),* fermented oil bean seed (Pentaclethra macrophylla), ayaraya oka (*Zea mays)* and bambara fufu, all had comparable fibre content. The carbohydrate content of the starchy staples were all within 40 - 45% range except for the boiled three-leafed yam that had 30%. The legume based dishes had comparable carbohydrate content ranging from 24 -32%. The energy content of these recipes varied depending on the base crop and the ingredients used. Bambara pudding had highest energy content of 247 kcal/100g while palm-pulp soup had the least energy content of 112 kcal/100g. The phosphorus compositions of the recipes ranged from 12.9±0.01 mg/100g for cassava fufu to 16.9±0.31mg/100g for African yam beam + wet abacha (*Manihot esculenta)* and vegetable. The copper content also ranged from 2.3±0.03µg/100g for plain African bread fruit to 10.0±0.05 µg/100g for melon soup. Iron and zinc values were very low. The vitamin content of the recipes varied. β-carotene content ranged from 1.9µg/100g in bambara fufu (*Vigna subterrenea*) to 16.99±0.01µg/100g in melon soup (*Citrillus vulgaris).* Ascorbic acid ranged from 2.6 mg/100g in dried cocoyam pudding to 29.3 mg in ogbono and egusi soups. Folic acid content ranged from 3.1 µg/100g in cassava fufu and bambara fufu to 18.7 µg/100g in ogbono soup (*Irvingia gabonensis*).

Percentage contribution of traditional foods to nutrient intake in Ede-Oballa community: The intake of 15 children 0 -2 years as shown in Table 2 were low in Ede-oballa in Enugu State, for energy (78.2%), calcium (69.4%), riboflavin (39.6%) and niacin (47.4%). The rest were adequate and exceeded FAO/WHO requirement values. Traditional foods contributed over 80% of the energy, vitamin A, B vitamins and ascorbic acid intake of these children. The legumes consumed contributed 60% to protein intake, 38% to energy intake and 30% to calcium intake. The majority (69.1%) of the vitamin A came from the red palm oil which was used in preparing their meals. Only 6.7% of the vitamin A came from vegetables. Legumes were significant contributors of thiamin (80.73%), riboflavin (44.37%) and niacin (54.9%). The ascorbic acid intake came mainly from starchy roots and tubers (54.1%). Also, vegetables made a substantial contribution of 31.4% to ascorbic acid. Contribution of traditional foods to calcium and iron were slightly low 56.5% and 34.5%, respectively.
The total food intake of 20 children 3 -5 years supplied adequate energy (101.24%), protein (149.8%), iron (228.43%), vitamin A (307.9%), thiamin (275.71%), niacin (141.59%) and ascorbic acid (440.05%), which were higher than FAO/WHO requirement intakes as shown in Table 3. Their intake was adequate for calcium (88.5%) and riboflavin (81.0%) only. Traditional foods contributed over 90% of the energy, protein, thiamin, niacin and ascorbic acid and over 70% of vitamin A and iron intakes of these children. Among the traditional foods, cereals made the most significant contribution to energy (31.1%) and niacin (39.9%). Legumes made the highest contribution to protein (49.1%). The calcium intake came mainly from vegetables (16.8%) and legumes (16.0%). About 26.5% of the iron came from cereals. This was followed by legumes (26.3%). Only 6.8% of the vitamin A came from vegetables. The rest (71.8%) came from red palm oil. Thiamin and riboflavin came mainly from nuts and seeds (33.9%) and 29.9%). The bulk of the ascorbic acid came from starchy roots and tubers (58.1%).
The energy, protein, calcium, iron, riboflavin and niacin intakes of 25 school children 6-12 years were low as shown in Table 4. Intakes were adequate for vitamin A (332.12%), thiamin (123.5%) and ascorbic acid (363.8%) which were higher than FAO/WHO recommended intake. Starchy roots and tubers contributed most of their energy intake (29.7%). This was followed by legumes (23.9%). The bulk of the protein, calcium and iron came from legumes (44.1%, 18.2% and 37.9%). Vegetables contributed only about 14.7% of the total vitamin A intake. Red palm oil was the major source of vitamin A (71.5%). Vegetables were also a significant contributor of thiamin (34.8%) and riboflavin (31.9%). Legumes also made some contribution to thiamin (35.7%). Nuts and seeds were also significant

Table 1: Proximate, mineral and vitamin composition of recipes as consumed in Igbo culture area

Food	Moisture %	Ash %	Fat %	Protein %	Fibre %	CHO %	Energy (Kcal/100g)
UK	47.36±0.2	3.6±0.6	10.1±0.2	11.9±0.2	1.2±0.5	25.99±0.0	242.46
CF	53.3±0.1	1.4±0.0	0.01±0.0	0.6±0.0	0.6±0.2	44.21±0.1	179.29
AL	50.14±0.3	1.8±0.6	4.5±0.0	3.4±0.1	0.5±0.0	39.73±0.1	212.89
OF	57.75±0.4	1.7±0.6	0.9±0.0	14.6±0.02	0.3±0.1	24.7±0.03	165.40
AC	49.72±0.2	2.0±0.1	3.98±0.01	2.78±0.02	0.35±0.0	41.13±0.01	211.46
DCP	51.83±0.45	2.2±0.0	0.00	0.57±0.05	0.43±0.05	45.0±0.02	182.28
EAO	64.81±0.25	3.7±0.10	5.98±0.05	5.14±0.01	0.7±0.32	19.68±0.02	153.10
AO	47.25±0.50	4.8±0.06	5.8±0.06	6.49±0.05	1.69±0.03	34.02±0.03	214.24
OS	65.22±0.22	0.4±0.07	3.1±0.05	3.34±0.04	0.35±0.01	27.64±0.03	151.82
BS	76.04±0.4	1.7±0.01	5.0±0.01	4.03±0.02	0.48±0.00	12.77±0.02	112.20
NS	56.25±0.1	5.25±0.06	7.00±0.06	5.38±0.03	1.58±0.26	24.54±0.03	182.68
OK	44.28±0.2	3.84±0.04	8.91±0.03	10.36±0.04	1.28±0.26	31.33±0.01	246.95
AYBP	55.42±0.4	3.12±0.05	2.05±0.02	6.55±0.26	1.34±0.17	31.52±0.04	170.71
AOB	52.6±1.18	1.71±0.1	5.0±0.02	7.92±0.3	0.14±0.00	32.63±0.11	207.20
DCF	54.85±0.06	0.68±0.25	0.05±0.01	0.27±0.01	0.12±0.06	44.01±0.01	177.17
AYBWAV	55.37±0.20	3.35±0.07	1.32±0.05	3.48±0.05	0.71±0.01	35.77±0.01	168.88
UKPO	54.38±0.00	1.60±0.00	3.42±0.12	2.05±0.12	0.26±0.05	38.29±0.03	192.14
BYO	66.25±0.12	1.82±0.15	0.17±0.18	0.41±0.18	0.64±0.15	30.71±0.01	126.01
UP	52.42±0.15	1.67±0.06	3.05±0.06	12.56±0.18	0.24±0.06	30.06±0.03	197.93
ES	54.12±0.06	5.32±0.21	9.41±0.32	5.00±0.32	2.07±0.28	24.08±0.03	201.01

Table 1: (continued)

Food	Iron mg/100g	Copper μg/100g	Zinc μg/100g	P mg/100g	β-carotene μg/100g RE	Ascorbic acid mg/100g	Folic acid μg/100g
UK	0.6±0.01	2.3±0.03	0.3±0.03	14.2±0.2	7.7±0.02	14.5±0.06	7.1±0.02
CF	0.6±0.0	3.4±0.0	0.2±0.01	12.9±0.1	3.9±0.02	4.6±0.01	3.1±0.04
AL	0.6±0.2	3.1±0.01	0.3±0.01	14.0±0.06	11.2±0.01	21.4±0.01	11.2±0.02
OF	0.3±0.2	3.4±0.05	0.25±0.0	13.8±0.0	1.93±0.01	8.0±0.01	3.06±0.01
AC	0.3±0.01	3.4±0.01	0.2±0.02	13.6±0.47	5.42±0.03	8.96±0.05	5.45±0.00
DCP	0.44±0.1	3.38±0.03	0.32±0.0	15.3±0.02	11.42±0.02	2.6±0.01	2.76±0.10
EAO	0.6±0.01	3.1±0.01	0.28±0.01	15.89±0.78	9.56±0.01	25.2±0.01	12.14±0.0
AO	0.32±0.01	3.25±0.03	0.25±0.02	14.9±0.26	9.27±0.02	14.2±0.12	5.04±0.04
OS	0.4±0.01	4.0±0.05	0.31±0.00	14.2±0.01	5.86±0.02	29.3±0.06	18.67±0.01
BS	0.44±0.00	3.4±0.05	0.35±0.05	14.5±0.33	8.72±0.03	18.92±0.01	6.53±0.01
NS	0.45±0.01	4.06±0.05	0.23±0.02	15.7±0.06	6.25±0.05	16.32±0.2	7.64±0.01
OK	0.77±0.03	3.1±0.28	0.15±0.03	16.5±0.18	8.18±0.01	17.2±0.40	6.4±0.10
AYBP	0.74±0.00	3.5±0.43	0.1±0.03	13.8±0.06	5.79±0.00	14.0±0.06	7.33±0.02
AOB	0.23±0.00	3.1±0.10	0.20±0.01	13.6±0.00	7.79±0.20	18.4±0.01	6.97±0.02
DCF	0.45±0.01	3.1±0.01	0.16±0.02	13.2±0.35	3.94±0.02	5.02±0.10	6.99±0.01
AYBWAV	0.56±0.01	3.5±0.03	0.15±0.01	16.9±0.31	6.16±0.05	14.4±0.05	6.06±0.01
UKPO	0.3±0.00	3.1±0.00	0.14±0.00	14.0±0.06	6.40±0.00	9.13±0.01	5.87±0.02
BYO	0.39±0.01	3.0±0.05	0.11±0.07	15.5±0.03	5.80±0.20	18.20±0.00	9.08±0.40
UP	0.6±0.01	3.6±0.03	0.2±0.04	14.8±0.25	5.79±0.01	16.22±0.02	8.74±0.01
ES	0.65±0.01	10.0±0.05	0.3±0.01	14.2±0.00	16.99±0.01	29.28±0.06	9.93±0.00

Mean±SD of three determinations.

Key to Table 1

Abbreviation	Local name	Common name	Scientific name
UK	Ukwa	African bread fruit	*Treculia africana*
CF	Akpu	Cassava	*Manihot esculenta*
AL	Abacha na akidi	Cassava strips + black cowpea	*Manihot esculenta + Vigna spp*
OF	Okpa fufu	Plain Bambara fufu	*Vigna subterranea*
AC	Achicha	Dried cocoyam + pigeon sea	*Colocassia esculenta + Cajanus cajan*
DCP		Dried cocoyam pudding	*Colocassia esculenta*
EAO	Egusi soup achara okazi	Melon Grain millets soup okazi	*Citrillus vulgaris+Pennisetum+Gnetum africanum*
AO	Ayaraya oka	Steamed maize pudding with vegetables	*Zea mays + Ameranthus spp*
OS	Ogbono soup	Dika nut soup/sauce	*Irvingia gabonensis*
BS	Ofe akwu	Banga soup/sauce	*Elaesis guinnensis*
NS	Nsala	White soup	*Teterotis niloticus*
OK	Okpa	Bambara pudding	*Vigna subterranean*
AYBP	Ijiriji na akpaka bean seed pottage	African yam bean + fermented oil	*Stenostylis stenocarpa Pentaclethrs macroplylla*
AOB	Akidi na ukpaka	Cowpea+fermented oil bean seed pottage	*Vigna unguiculata+Pentaclethra macrophylla*
DCF	Akpu fufu	Dried cassava fufu	*Manihot esculenta*
AYBWV	Ijiriji na abacha mmiri na Akwukwo nni	African yam bean + wet cassava + garden egg leaves	*Stenostylis stenocarpa, Manihot esculenta, Solanum spp.*
UKPO	Ukpo ogede	unripe and ripe plantain pudding	*Musa paradisiaca*
BYO	Ona esiresi	Boiled three-leafed yam	*Dioscorea dumentorum*
UP	Ukwa na akanwa	Boiled African bread fruit with potash	*Treculia Africana*
ES	Egusi soup	Melon soup	*Citrillus vulgaris*

Table 2: Mean total intake of children 0-2years and contribution of traditional foods to the mean intake in Ede-Oballa Community

	Energy (kcal)	Protein (gm)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Total intakes	930.5±60.5	18.03±12.3	312.51±80.2	33.59±10.2	1473.8±156.3	1.00±0.1	0.33±0.02	4.08±1.2	59.18±21.4
RequirementFAO/WHO	1250	16	450	8.5	400	0.5	0.8	8.6	20
% intake of requirement	78.2	112.7	69.4	77.5	418.5	202	39.6	47.4	145.9
Starchy roots/tubers	154.75±10.2	1.17±0.2	22.30±2.5	1.22±0.32	4.45±1.3	0.04±0.0	0.04±0.0	0.19±0.1	31.95±3.5
% contribution of roots and tubers	16.6	3.09	7.1	3.62	0.12	4.8	13.31	4.8	54.06
Vegetables	12.4±2.2	0.96±0.1	38.18±1.6	0.65±0.1	100.03±12.4	0.02±0.0	0.07±0.1	0.21±0.1	18.59±2.5
% contribution of vegetables	1.34	2.53	12.2	1.94	6.7	2.08	21.59	5.34	31.41
Nuts and seeds	84.84±12.1	3.42±0.8	22.50±3.5	3.07±0.7		0.01±0.0	0.02±0.0	0.4±0.1	
% contribution of nuts and seeds	9.12	9.01	7.2	9.1		1.28	8.28	9.8	
Legumes	355±12.0	10.8±5.6	92.92±12.5	5.84±1.3	79.96±5.8	0.82±0.2	0.15±0.1	2.24±0.5	
% contribution of legumes	38.17	60.15	29.7	17.4	5.43	80.73	44.37	54.9	
Cereals	120.91±10.2	2.98±0.8	2.2±0.1	0.79±0.3		0.06±0.0	0.01±0.0	0.73±0.2	0.26±0.0
% contribution of cereals	12.99	7.85	0.9	2.4		5.92	2.07	17.9	0.44
Palm oil	156.15				1018.5				
% contribution of palm oil	16.7				69.1				
Total from traditional foods	94.92	82.63	56.5	34.46	81.35	94.71	89.62	92.74	85.90

Table 3: Mean total intake of children 3-5years and contribution of traditional foods to the mean intake in Ede-Oballa Community

	Energy (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Total intakes	1542.36±60.2	24.28±4.8	398.3±56.2	13.97±11.2	231.7±106.7	1.93±0.5	0.73±0.01	7.91±1.3	88.45±15.6
Requirement FAO/WHO	1550	16.2	400-500	7	400	0.7	0.9	11.2	20
% intake of requirement	101.24	149.8	88.50	228.43	307.9	275.71	81.0	141.59	440.05
Starchy roots/tubers	353.13	5.98	73.52	6.25		0.353	0.1	2.26	52.0
% contribution of roots and tubers	22.50	13.50	18.46	19.56	0	18.29	13.33	28.57	58.1
Vegetables	18.96±1.5	1.72±0.5	66.88±11.2	1.51±0.6	832.07±5.2	0.06±0.1	0.06±0.1	0.46±0.1	28.00±6.2
% contribution of vegetables	1.21	3.88	16.79	4.707	6.75	3.16	7.82	5.75	31.60
Nuts and seeds	44.61±5.6	1.81±0.4	9.60±0.6	2.09±0.2		0.66±0.1	0.23±0.0	0.08±0.0	0.00
% contribution of nuts and seeds	2.84	4.09	2.41	6.54		33.94	29.89	0.99	
Legumes	332.24±20.2	21.72±3.5	63.74±6.5	8.42±4.5	20.01±5.5	0.46±0.1	0.25±0.01	1.67±0.5	0.0±0.0
% contribution of legumes	21.17	49.05	16.00	26.34	0.16	24.09	17.12	21.11	
Cereals	488.66±22.7	11.62±2.4	22.43±8.1	8.48±3.2	13.5±7.1	0.29±0.1	0.07±0.1	3.16±0.3	9.21±0.5
% contribution of cereals	31.14	26.24	5.63	26.51		14.82	4.73	39.95	10.41
Palm oil	202.08				88.52				
% contribution of palm oil	12.88				71.82				
Total from traditional foods	91.67	96.7	59.25	83.65	78.74	94.3	72.8	94.3	100

contributors of riboflavin (30%). Niacin was derived mainly from legumes (28.4%), cereals (25.9%) and starchy roots and tubers (23.6%). Starchy roots and tubers were the most significant contributor of ascorbic acid (53.9%). However, vegetables made a 25.6% contribution to ascorbic acid.

The intakes of 30 mothers as shown in Table 5 were adequate for protein (176.3%), iron (161.55%), vitamin A (590.50%), thiamin (154.4%) and ascorbic acid (135.5%) higher than FAO/WHO recommended intake for adults. However, their intake was inadequate for energy (82.4%), calcium (84.8%), riboflavin (60.8%) and niacin (60.1%). Starchy roots and tubers, cereals and legumes made 27.4%, 25.5% and 24.1% contribution to energy respectively. Legumes were also significant contributors of protein (50.9%), calcium (22.01%), thiamin (53.2%), iron (35.3%) and niacin (33.5%). Again, vitamin A was received from red palm oil (50.8%) while 28.2% came from vegetables. Riboflavin was derived mainly from cereals (26.6%), legumes (24.1%) and vegetables (24.1%). The bulk of the ascorbic acid (50.7%) came from starchy roots and tubers for this group equally as with 3-5 year olds.

Percentage contribution of traditional foods to nutrient intake in Aku community: Intake of 15 children 0-2yrs as shown in Table 6 were inadequate for energy, calcium, iron, all B - vitamins and ascorbic acid in Aku community in Ezinifite, Anambra state.

Traditional foods contributed over 75% of the calcium, iron, thiamin, riboflavin and ascorbic acid intake of these children. Nuts and seeds contributed most of the energy (25%), protein (21.9%) and calcium (26.8%) intakes. Equally, vegetables made substantial contribution to the calcium (27.9%) intake of the children. The iron intake came mainly from starchy roots and tubers (22.7%) and cereals (27%). Only 25.2% of the vitamin A intake was from vegetables. Fruit intakes were very low. The rest of the vitamin A calculated came from the red palm oil which was the only vegetable oil recorded during the food intake study. Thiamin and niacin came mainly from starchy roots and tubers (23%) and cereals (36%), respectively while the bulk of riboflavin and ascorbic acid came from vegetables (64.6% and 59.9%) respectively.

Table 7 showed the total nutrient intake of 20 children 3 - 5 years which were adequate except for the following nutrients energy, calcium, riboflavin and niacin intakes. Over 80 - 100% of thiamin and riboflavin intakes came from traditional foods. Traditional foods made some contributions to intake, ranged from 37.9% to iron from 103% for ascorbic acid. Nuts and seeds again made the most significant contributions to energy (29.7%), protein (26.9%) and calcium (29.5%) intakes. Among the traditional foods, starchy roots/tubers (14.6%) made the

Table 4: Mean total intake of children 6-12years and contribution of traditional foods to the mean intake in Ede-Oballa Community

	Energy (kcal)	Protein (mg)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Total intakes	1027.94±101.2	26.94±12.6	272.42±70.1	12.15±8.3	1494.58±506.1	1.05±0.02	0.47±0.01	4.75±1.1	10.94±10.5
RequirementFAO/WHO	1950	31	550	16	450	0.85	1.2	14.0	25
% intake of requirement	52.67	86.90	49.53	75.94	332.13	123.5	39.17	33.93	363.76
Starchy roots/tubers	305.19	2.76	26.98	1.49	17.14	0.15	0.06	1.12	56.56
% contribution of roots and tubers	29.7	10.2	9.9	12.3	1.15	14.1	11.7	23.6	53.9
Vegetables	21.53±5.6	2.03±1.0	45.45±6.6	1.62±1.2	219.03±50.2	0.36±0.1	0.15±0.1	0.5±0.1	26.14±5.5
% contribution of vegetables	2.09	7.5	16.7	13.3	14.65	34.8	31.9	10.4	25.6
Nuts and seeds	51.48	2.40	12.59	1.35	80.1±1.5	0.02	0.14	0.12	0
% contribution of nuts and seeds	5.0	8.9	4.6	11.1	5.53	1.4	30	2.57	
Legumes	246.01±40.2	11.88±2.1	49.71±1.3	4.60±0.5	10.72±1.2	0.38±0.1	0.09±0.1	1.35±0.1	0
% contribution of legumes	23.9	44.1	18.2	37.9	0.72	35.7	17.9	28.4	
Cereals	191.08±11.2	4.62±1.2	9.06±1.0	1.31±0.2	1.67±0.5	0.14±0.01	0.03±0.01	1.23±0.2	0.32±0.01
% contribution of cereals	18.6	17.1	3.3	10.8	0.3	13.4	5.5	25.9	0.32
Palm oil	166.05				1069				
% contribution of palm oil	16.2				71.52				
Total	95.5	87.8	52.7	85.4	93.87	99.4	97	90.9	79.82

Table 5: Mean total intake of mothers and contribution of traditional foods to the mean intake in Ede-Oballa Community

	Energy (kcal)	Protein (mg)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg
Total intakes	1813.09±1067.8	41.14±29.24	424.48±270.60	23.07±11.46	295.26±675.82	1.39±0.89	0.79±0.53	7.29±4.42	40.65±6.48
Requirement FAO/WHO	2200	29	500	14.28	500	0.9	1.3	14.5	30
% intake of requirement	82.41	141.9	84.8	161.55	590.52	154.4	60.77	60.07	135.5
Starchy roots/tubers	497.5±11.7	4.99±2.1	82.34±12.3	2.95±1.2	24.41±7.2	0.25±0.01	0.12±0.01	1.86±0.2	20.62±5.2
% contribution of roots and tubers	27.4	9.75	19.40	12.78	0.82	18.13	14.56	25.02	50.7
Vegetables	27.80±5.2	1.93±0.6	78.21±4.2	1.85±1.0	831.66±60.1	0.1±0.0	0.19±0.0	0.55±0.1	10.4±1.2
% contribution of vegetables	1.53	3.77	18.42	8.02	28.2	7.19	24.05	7.53	23.65
Nuts and seeds	86.92	5.08	19.88	2.60		0.02	0.091	0.26	0.0
% contribution of nuts and seeds	4.79	9.84	4.68	11.27		1.58	0.12	3.62	
Legumes	436.11±4.5	26.06±10.2	93.42±7.5	8.14±2.1	30.7±6.7	0.74±0.2	0.19±0.1	2.44±1.2	0.28±0.1
% contribution of legumes	24.05	50.96	22.01	35.28	1.03	53.24	24.05	33.49	0.60
Cereals	445±12.6	10.43±4.2	21.53±2.5	3.77±1.1	35.93±7.2	0.35±0.1	0.21±0.0	1.783±0.1	2.37±0.3
% contribution of cereals	24.54	20.39	5.07	16.34	1.22	14.67	26.58	24.45	5.8
Palm oil	252.47				1500				
% contribution of palm oil	13.94				50.8				
Total from traditional foods	96.25	94.8	69.59	83.69	82.07	94.81	89.36	94.11	80.8

highest contribution to iron intake. This was followed by vegetables and cereals 8.5% each and legumes (4%). About 62% of the ascorbic acid came from starchy roots and tubers. The B - vitamins (thiamin, riboflavin and niacin) came mainly from starchy roots/tubers (12.2%, 11.5%, 15%) vegetables (35.3%, 20.4, 5.2%) and cereals (35.3%, 20.4%, 5.2%) respectively.

In Table 8 the intake of school children 6-12years of age followed almost the same pattern as that of the pre-school children. Intakes were adequate for protein (147%), vitamin A (170.5%), thiamin (107%) and ascorbic acid (292%) of requirement values. Iron intake was inadequate (95.6% of requirement), although the male subjects met over 100% of their requirement (106%) while the females met only about 86.8% of their daily requirement. The energy (77.9%), calcium (59.6%), riboflavin (46.7%) and niacin intakes (65.3%) were grossly inadequate. For this group of children, starchy roots and tubers provided most of their energy intake (34.2%) compared to the other traditional food groups (1.7 - 14.8%). The bulk of their protein intake among the traditional foods came from legumes (23%) as opposed to other groups (0.9 -9.6%). Calcium was derived from starchy staples (27.3%), vegetables (21.0%) and legumes (14.1%). Starchy roots and tubers were also significant contributors of the B-vitamins thiamin (34.6%), riboflavin (42.5%) and niacin (31.0%). Vegetables were important contributors of riboflavin (21.6%) and ascorbic acid (33.6%), while legumes made some reasonable contribution to thiamin (25.8%), riboflavin (13.9%) and niacin (14.2%).

Table 9 showed the intakes of mothers which were inadequate for calcium (86%), riboflavin (47.7%) and niacin (85%) of requirement values. For these adult mothers, starchy roots and tubers contributed 20 - 29% of the intake of most nutrients except for iron (12%) protein (9.3%) and vitamin A (<1%). Vegetables contributed about 26% each to calcium and riboflavin intakes and substantially to ascorbic acid intake (56%). Again, vitamin A came mainly from red palm oil (85.5%) and vegetables (14.6%). Generally, traditional foods contributed 70 - 103% of the intakes for energy (73.8%), calcium (84.4%), vitamin A (103.7%) and ascorbic acid (85.7%).

DISCUSSION

The traditional foods/diets of the Igbo culture area are plant based with little contribution made by meat or milk and their products. Some of these foods undergo some form of processing (e.g. fermentation) but in most cases, traditional foods do not undergo serious processing before consumption apart from the normal cooking process. The high moisture content of traditional foods/diets is not surprising as they have always been described as very bulky and low in energy and nutrient densities. This makes them unsuitable for feeding young children with small stomach capacities. The study showed that children 0 - 6 months in the Igbo

Table 6: Mean total intake of children 0-2years and contribution of traditional foods to the mean intake in Aku community of Anambra State

	Energy (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Mean intakes	788.66±227.03	16.49±7.18	165.63±61.29	6.20±4.65	1078.65±531.26	0.33±0.27	0.48l±0.410	3.17±1.89	29.80±17.74
Requirement for age/sex/weight	1250	16.0	450	8.5	400	0.5	0.8	8.6	20
% intake of requirement	63.1	103.1	36.8	72.9	269.7	66	60	36.86	104.0
Starchy roots/tubers	123.05±110.17	1.22±0.95	28.38±23.56	1.41±0.84	3.96±2.16	0.077±0.02	0.043±0.035	074±0.61	4.41±2.90
% contribution of roots and tubers	15.6	4.60	17.13	22.7	0.11	23.3	8.96	23.3	15.3
Vegetables	16.75±11.65	1.34±0.93	46.18±39.86	1.01±0.70	897.24±95.82	0.017±0.8	0.31±0. 6	0.31±0.21	17.25±13.22
% contribution of vegetables	2.12	5.06	27.88	16.29	25.21	5.15	64.58	9.78	59.90
Nuts and seeds	200.53±20:55	5.80±0.35	44.37±7.09	0.22±0.21	0.03±0.01	0.00±0.0	0.00±0.0	0.00±0.0	0.00±0.0
% contribution of nuts and seeds	25.43	21.90	26.79	3.5	0.00	0.09	0.77	0.15	0.00
Legumes	18.63±9.85	1.23±0.97	5.36±3.57	0.40±0.3	0.01±0.02	0.04±0.06	0.08±0.01	0.14±0.23	0.05±0.08
% contribution of legumes	2.36	4.6	3.24	6.45	0.01	12.24	1.79	4.70	0.18
Cereals	146±2.92	3.72±0.44	6.8±03.6	1.68±0.36	6.4±2.8	0.12±0.4	0.03±0.06	0.72±0.44	1.2±0.4
% contribution of cereals	18.5	14.04	4.11	27.0	0.18	36.36	6.67	22.71	4.17
Red palm oil	128.45				864.55				
% contribution of red palm oil	16.3				80.2				
Total from traditional foods	80.3	50.2	79.15	75.94	105.7	77.14	82.77	60.64	79.55

Table 7: Mean total intake of children 3-5years and contribution of traditional foods to the mean intake in Aku community of Anambra State

	Energy (kcal)	Protein (g)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg
Mean intakes	1207.47±21.49	44.12±12.78	261.78±89.85	9.78±.60	3302.15±1957.84	0.68±0.57	0.26±0.202	5.005±3.70	22.09±1.75
Requirement for age/sex/weight	1550	16.2	400-500	7	400	0.7	0.9	11.2	20
% intake of requirement	77.9	272.3	58.2	125.4	325.5	97.1	28	44	110.5
Starchy roots/tubers	118.62±88.7	1.39±0.21	22.43±16.97	1.424±0.80	2.16±0.73	0.08 0.07	0.03±0.02	0.75±0.53	13.6±3.21
% contribution of roots and tubers	9.82	3.15	8.57	14.56	0.07	12.21	11.46	14.99	62.0
Vegetables	16.46±12.08	2.65±.74	72.70±15.46	0.835±0.74	568.72±79.43	0.24±0.3	0.05±0.04	0.26±0.24	8.72±03.07
% contribution of vegetables	1.36	6.01	27.85	8.54	17.22	35.29	20.38	5.19	39.6
Nuts and seeds	358.44±74.26	11.86±12.31	77.80±24.80	0.22±0.20	0.031±0.03	0.00±0.00	0.00±0.00	0.01±0.01	0.01±0.01
% contribution of nuts and seeds	29.69	26.88	29.5	2.25	0.01	0.44	0.30	0.12	0.03
Legumes	17.95±02.2	1.183±0.45	5.17±0.34	0.39±0.48	0.01±0.01	0.03±0.04	0.01±0.01	0.14±0.18	0.051±0.06
% contribution of legumes	1.49	2.69	1.97	3.99	0.0003	5.74	3.08	2.80	0.23
Cereals	410.63±71.22	10.46±08.12	19.13±03.13	4.725±0.18	18.00±3.18	0.34±0.09	0.09±0.6	2.02±0.51	3.38±0.85
% contribution of cereals	34.00	23.7	7.3	8.54	17.22	35.29	20.38	5.19	2.11
Red palm oil	99				2179				
% contribution of red palm oil	8.20				66.0				
Total from traditional foods	84.56	62.43	75.12	37.9	100.29	88.97	54.76	28.29	103.97

culture area are fed breast milk and food from the family pot, fruits were virtually absent from their diets. In all communities' studied, these traditional foods/diets did not meet the energy, calcium and the B-vitamin (niacin and riboflavin) needs of these children. The traditional foods/diets as they were prepared for adults served as complementary foods. Apart from pap (maize gruel) no special complementary food was prepared and given to children 0 - 6 months. However, since the traditional foods contributed about 75 - 80% of some of these nutrients, it is hoped that if breast-feeding is carried out continuously and substantially, for 2 years the deficiencies could be made up for. Studies have shown the average breast-feeding duration to be about 15 to 18 months.

Energy supply from traditional foods/diets was adequate for 3 - 5 year olds only in Ede-Oballa community. However, all the children in this age group had inadequate intake of calcium and riboflavin from traditional foods/diets. This is probably because vegetable, grains, nuts and seeds which are rich sources of these nutrients were not consumed in sufficient quantities. Another reason was the frequency of feeding (2 - 3 times/day); which is considered low for children of this age.

The intake of energy, riboflavin iron, calcium and niacin from traditional foods/diets was grossly inadequate for school children 6 - 12 years of age. The problem in this age group was that starchy roots and tubers constituted their major source of nutrient. These staples made substantial contributions to their energy intake (30 - 34%) compared to other food groups (1.7 - 15%). Fruits were also not part of the diets. This group of children will indeed require and benefit from special intervention (school lunch) programme bearing in mind the detrimental effects of poor feeding and nutrient intake on academic performance.

For mothers in the Igbo culture area the picture was not different. Their intakes of calcium, riboflavin and niacin from traditional foods/diets were inadequate. In Ede-Oballa, energy intake was also low. Studies have shown that pregnant mothers at times deliberately reduce their food intake so as not to have big babies (Okeke *et al*., 2006). On the other hand, for non-pregnant, non lactating mothers their sacrificial tendencies could cause them reduce intake so as to feed other members of the family (Oke, 1968). These could have affected their intakes. It has been observed that these foods/diets could make substantial contributions to intakes if they are consumed in sufficient quantities supporting earlier finding (Okeke and Nnanyelugo, 1989). In general, almost all the age groups had problems with meeting the calcium, B-vitamin (especially riboflavin and niacin) and energy intakes. Although deficiencies of iron and vitamin A have long been established as public health problems, we fond that both nutrients were adequate for most of the

Table 8: Mean total intake of children 6-12years and contribution of traditional foods to the mean intake in Aku in Anambra State

	Energy (kcal)	Protein (gm)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg
Mean intakes	1519.56±425.18	45.66±12.67	327.77±100.65	15.3±4.84	767.4±367.52	0.91±0.35	0.56±0.38	8.99±2.15	73.07±115.90
Requirement for age/sex/weight	1950	31	550	16	450	0.85	1.2	14.0	25
% intake of requirement	77.9	147	59.6	95.6	170.5	107.1	46.7	64.3	292.3
Starchy roots/tubers	519.23±452.65	4.40±3.41	89.419±76.15	4.43±3.81	137.38±400.07	0.315±0.27	0.238±0.38	2.97±2.50	11.43±10.87
% contribution of roots and tubers	34.17	9.64	27.28	28.95	1.79	34.62	42.5	31.01	15.64
Vegetables	38.81±20.22	2.51±1.62	68.87±66.22	2.07±1.54	1175.05±907.07	0.03±0.04	0.12±0.09	0.65±0.52	24.55±20.02
% contribution of vegetables	2.55	5.50	21.01	13.53	15.30	3.75	21.61	7.22	33.60
Nuts and seeds	25.18±42.65	0.41±0.44	2.27±4.58	0.48±0.55	0.049±0.092	0.00±0.00	0.00±0.00	0.02±0.02	0.01±0.02
% contribution of nuts and seeds	1.66	0.90	0.69	3.14	0.006	0.33	0.36	0.18	0.01
Legumes	160.09±193.53	10.55±12.76	46.13±55.80	2.47±3.22	0.138±0.21	0.23±0.27	0.07±0.09	1.28±1.54	0.46±0.55
% contribution of legumes	10.54	23.11	14.07	16.16	0.002	25.82	13.93	14.23	0.63
Cereals	57.43±123.64	1.11±2.39	1.80±3.86	0.29±0.63	0.00	0.01±0.04	0.01+ 0.01	0.44+ 0.94	0.00
% contribution of cereals	3.78	2.43	0.55	1.92	0.00	2.09	0.89	4.89	0.00
Red palm oil	292.3				64.00				
% contribution of red palm oil	14.8				83				
Total from traditional foods	67.5	41.58	63.6	63.7	100	66.61	79.29	57.53	49.88

Table 9: Mean total intake of mothers and contribution of traditional foods to the mean intake in Aku in Anambra State

	Energy (kcal)	Protein (gm)	Calcium (mg)	Iron (mg)	Vitamin A (RE)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Total intakes	2202.2±451.49	61.43±13.23	432.09±115.52	43.08±65.18	894.29±33.75	1.38±0.63	0.62±0.25	11..90±3.32	60.1±34.40
Requirement FAO/WHO	2200	29	500	14.28	500	0.9	1.3	14.5	30
% intake of requirement	100.09	211.8	86.4	153.86	178.9	153.3	47.69	85.0	200.3
Roost/tubers	588.76±23.1	5.74±1.1	124.24±10.8	5.16±0.9	13.72±8.0	0.414±0.2	0.12±0.1	3.29±1.2	15.81±3.5
% contribution of toots/tubers	26.74	9.34	28.75	11.98	3.15	30.0	20.65	27.65	26.31
Vegetables	49.68±27.03	3.23±1.96	111.42	2.57±1.89	130.5±11.74	0.05±0.02	0.16±0.01	0.776±0.02	33.63±9.2
% contribution of vegetables	2.26	5.26	25.79	5.97	14.6	3.99	25.94	6.52	55.96
Nuts/seed	253.33±24.5	18.08±7.2	79.40±8.8	0.42±0.1	0.04±0.01	0.01±0.00	0.00	0.02±0.00	0.00
% contribution of nuts/seeds	11.50	29.43	18.38	0.97	0.00	0.43	088	0.21	0.01
Legume	134.12±12.4	1.84±0.4	38.62±9.5	2.90±0.3	0.11±0.02	0.24±0.01	0.06±0.01	1.07±0.01	0.38±0.01
% contribution of legumes	6.09	2.9	8.94	6.73	0.0	17.39	10.32	9.0	0.63
Cereal	250.31±31-5	6.07±1.0	10.90±2.2	2.56±3.5	8.8±1.2	0.18±0.0	0.04±0.0	1.36±0.6	0.38±0.1
% contribution of cereals	11.37	9.88	2.52	5.94	0.10	13.04	7.7	11.43	2.75
Red palm oil	34.0				767.05.0				
% contribution of red palm oil	15.5				85.5				
Total from traditional foods	73.8	56.8	84.38	31.59	103.7	64.85	65.12	54.8	85.66

groups. However, their bioavailability were not determined or taken into account. Since these foods/diets are plant based, fruits were not taken even with meals and very small quantities of meat were consumed. It is likely that the bioavailability of these nutrients would be low. In addition to these micronutrients, it will be necessary to also focus attention on the consumption of calcium, riboflavin and niacin among the vulnerable groups and the public in general, because of their role in human nutrition. For example dietary calcium has been shown to have more effect than supplementation in lowering systolic blood pressure (SBP) of 1.4 mm Hg and diastolic blood pressure (DBP) of 0.8mm Hg in the general population (Griffith, 1999).

Conclusion: Traditional foods/diets contributed over 90% of the energy intake of rural communities in the Igbo cultural area. There were community variations in the contribution of specific food groups. In Anambra state, nuts and seeds made substantial contributions to energy, protein, calcium and iron intakes, while in Enugu state, legumes and cereals significantly contributed to the intake of these nutrients. Further more, the bulk of ascorbic acid came from vegetables in Anambra state (34 - 62%, while in Enugu state much of the ascorbic acid (51 - 58%) came from starchy roots and tubers. These variations need to be taken into consideration when planning intervention programmes for these communities. Interventions to solve these problems are highly recommended. These will include increasing the energy and nutrient densities of traditional foods/diets through appropriate processing and preparation techniques, school lunch programmes (where possible), dietary diversification to help mothers have wider choice of products, nutrition education and health promotion activities with emphasis on traditional foods that would lead to modification of diets and eating habits.

REFERENCES

Association of Official Analytical Chemists, 1995. AOAC Washington, DC.

Atinmo, T., 1993. National Micronutrient Survey - Nigeria: OMNI, USAID and UI.

FAO/WHO, 1988. Requirement of Vitamin A, Iron, Folate and Vitamin B_{12}. Food and Agricultural Organization, Rome.

FAO/WHO/UNU, 1985 Energy and Protein Requirements. Technical Report Series Geneva: No. 724.

Griffith, I.F., 1999. The influence of dietary and non - dietary calcium supplementation on blood pressure: An updated meta-analysis of randomized controlled trials. Am. J. Hypertens, 12: 84-92.

Ndiokwere, N.I., 1988. Search for Greener Pastures: Igbo and Africa Experience, U.S.A: Morris Publishing.

Oke, O.L. 1968. Composition of Some Nigerian Leafy Vegetables. J. Am. Diet. Assoc., 1097: 130-133.

Okeke, E.C. and D.O. Nnanyelugo, 1989. Intrafamilial Distribution of Food and Nutrients in a Rural Nigerian Population. Ecol. Food. Nutr., 23: 109-123.

Okeke, E.C., H.N. Ene-Obong A.O. Uzuegbunam, A. Ozioko and H. Kuhnlein, 2006. “Igbo Indigenous Knowledge of Local Foods Diversity to Improve Nutrition”. Paper presented at 6th International Conference on Dietary Assessment Methods Copenhagen, Denmark April, 27-29, 2006.

Onwuejiogwu, M.A., 1984. Civilization, Nri Kingdom and Hegemony. London: Ethiope Publishing Corporation.

Popkin, B.M., 2002. “The Shift in the Stage of Nutritional Transition in the Developing World Differs From Past Experience. The J. Public Health, 5: 205-214.

The World Health Organization Press, 1998. WHO Life in the Twenty First Century: A Vision for All. The World Health Report. Geneva.