NUTRIENT COMPOSITION OF SOME TRADITIONAL FOODS CONSUMED BY PRESCHOOLERS IN RIVERS SOUTH SENETORIAL ZONE

Abstract

This work assessed the nutrient contents of some traditional dishes consumed by preschool children (2–5-year-olds), in Rivers West senatorial zone, Rivers State. Random sampling technique was used to select 96 caregivers/parents from the eight local government areas in the zone. Data on frequently consumed traditional foods were obtained through focus group discussions with caregivers/parents. Aliquots of eight frequently consumed traditional cooked foods were analysed using standard methods. Results of analysed frequently consumed traditional dishes per 100 g showed that amafulo with eba had the highest energy (187.11 kcal), protein (7.03 g), fat (17.64 g), crude fibre (5.13 g), and vitamin A (244.929 µg RE) values. Burufulo was the highest in moisture (77.01 g), zinc (17.58 mg) and carbohydrate (6.92 g). Ofe-ede/fufu had the highest ash (1.23 g) and calcium (4385.77 mg) contents. Iron was significantly higher in ohwe ede etcha (193.77 mg) than in other dishes. Ede soup/ogbolo proved superior in iodine (11.340 µg). Folate was very low in all food samples with the highest value in ohwe ede etcha (0.05 µg). The nutrient contents of these traditional dishes revealed that they had good nutrient profiles and are readily available to combat malnutrition; however, consumption rate and nutrition education should be considered to maximize their full potentials.

Introduction

Traditional foods have been shown to be a major source of nutrients in preschool nutrition as it does not only support growth and development but also combats malnutrition (Nepfumbada et al., 2021). In Rivers State, lands and water bodies have been polluted by oil spillage impacting local crops and livestock production (Okari et al., 2019). This in turn has affected livelihoods which have been worsened by the dwindling economy of the country and nutritional status especially of the vulnerable population negatively. Preschool children in rural areas are particularly at risk of malnutrition due to poor purchasing power, limited age-appropriate foods and a lack of knowledge of food complementation using ingredients locally available (Sawyer et al., 2013). This has also encouraged increased consumption of highly processed, micronutrient-poor convenience foods which are usually energy dense, high in sodium, added sugars and low in dietary fibre. This coupled with unavailability of nutrition and health programmes targeted at this age group in these regions has led to an increased risk of morbidity and mortality.

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Data on nutrient content of food is fundamental in determining adequacy of food and planning nutrition education and diets of any individual or a group of people but the food composition data for Nigeria is limited in foods and nutrients and there is no known published work specifically referencing foods in Rivers State. The lack of sufficient data makes it difficult for nutrition professionals who depend on these food composition tables to plan for nutrition education, and therapeutic diets using foods in the area.

Materials and method

The study was conducted in eight communities of eight local government areas(4 Upland and 4 coastal communities) of Rivers state. Data collection was done using questionnaire, focus group discussion (FGD), and chemical food analysis for the study. Focus Group Discussion (FGD) sessions were held in all eight (8) communities chosen for the study and comprised twelve care givers (Nyumba et al., 2018) whose children were aged 2-5 years old. The sessions were carried out to elicit information on the types of dishes fed to preschool children frequently and the method of preparation. A structured questionnaire was used to obtain data on demographics, types of traditional dishes fed to children 2-5 years old, factors that influence their choices of food. These were obtained from caregivers and mothers of preschool children who participated in the study. The questionnaire was researcher/interviewer administered. Data analysis was done using methods described by the Association of Analytical Chemists (AOAC, 2010) for the macro and micro nutrients studied. Carbohydrate content was assessed by difference. Analysis was done in triplicates. Statistical Product and Service Solutions (SPSS, Version 25.0) software was used for statistical analysis. Statistical analysis was carried out using descriptive statistics.

Food sample collection, preparation, and homogenization

During the focus group discussion (FGD), different types of traditional dishes peculiar to each community and fed to children 2-5 years were documented and the most frequently consumed identified. Thereafter eight dishes of cooked food samples were collected from volunteers in different household on a set date. The foods were packaged in well-labelled air-tight plastics and frozen pending analysis. On the day of analysis, the samples were thawed to room temperature, then it was homogenised using a household food processor and then analysed. The proximate and micronutrient contents of the foods were analyzed per 100g edible portion, and the mean

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values reported. The analyses were carried out at the Prof Julius Okojie central research laboratory at the Federal University of Technology, Akure, Ondo state.

Result

Table 1 represents the proximate composition and energy values of foods consumed by preschool children (2-5 years) per 100 g. The moisture content of the dishes ranged from 69.0 g in *amafulo* to 76.42 g in *okurufulo na otirana*. The ash content ranged from 0.66 g in *odorfulo* with eba to 1.23 g in *ede*-soup with *fufu*, the ash composition of *onunu* with catfish pepper soup (1.19 g) was comparable to that of *burufulo (1.11g)* There was no significant difference ($p>0.05$) in the ash contents of foods. Protein values of *okurufulo na otirana* (5.25 g) was significantly lower than that of *amafulo* (7.03 g). Fibre contents of dishes ranged from 0.53 g in *odorfulo* with *eba* to 5.13 g in *amafulo*, these were statistically different ($p<0.05$). The carbohydrate composition of the dishes was highest in *onunu* with catfish pepper soup (6.85 g) and lowest in *okurufulo na otirana* (0.04g); this difference was significant ($p<0.05$). The energy values of the dishes ranged from 125.34 kcal in *burufulo* to 187.11 kcal in *amafulo*. There was no significant difference ($p>0.05$) in the energy composition of these dishes.

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Table 1: Proximate composition and energy values of some traditional foods consumed by preschool children (2-5 years) per 100 g on wet weight basis

Food Samples	Moisture(g)	Ash(g)	Protein(g)	Fat(g)	Fibre(g)	Carbohydrate(g)	Energy (kcal)
	Means±SD	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$	$\bar{x}$
Ononu with catfish pepper soup	$71.09^{b} \pm 0.05$	$1.19^{f} \pm 0.01$	$5.98^{c} \pm 0.01$	$13.73^{b} \pm 0.09$	$1.16^{c} \pm 0.04$	$6.85^{f} \pm 0.15$	$174.42^{d} \pm 0.65$
Okurufulo na otirana	$76.42^{f} \pm 0.01$	$1.11^{d} \pm 0.01$	$5.25^{a} \pm 0.07$	$15.05^{e} \pm 0.06$	$2.13^{e} \pm 0.02$	$0.04^{a} \pm 0.01$	$156.77^{b} \pm 0.25$
Odorfulo with eba	$76.07^{e} \pm 0.01$	$0.66^{a} \pm 0.01$	$6.01^{c} \pm 0$	$14.51^{d} \pm 0.01$	$0.53^{a} \pm 0.04$	$2.22^{d} \pm 0.03$	$163.60^{c} \pm 0.24$
Ofe-ede with fufu	$76.10^{e} \pm 0.02$	$1.23^{h} \pm 0.06$	$6.63^{e} \pm 0$	$14.11^{c} \pm 0.02$	$1.29^{d} \pm 0.04$	$0.64^{b} \pm 0.11$	$156.19^{b} \pm 0.62$
Burufulo	$77.01^{g} \pm 0$	$1.20^{g} \pm 0.02$	$5.76^{b} \pm 0.05$	$8.28^{a} \pm 0.01$	$0.83^{b} \pm 0$	$6.92^{f} \pm 0.02$	$125.34^{a} \pm 0.05$
Ohweedeetcha (fufu)	$71.44^{c} \pm 0.02$	$0.78^{b} \pm 0$	$6.26^{d} \pm 0.03$	$16.45^{g} \pm 0.06$	$2.13^{e} \pm 0.02$	$2.94^{e} \pm 0.09$	$184.^{97f} \pm 0.32$
Ede soup with (ogbolo)	$73.42^{d} \pm 0.02$	$0.85^{c} \pm 0.01$	$7.00^{f} \pm 0$	$16.06^{f} \pm 0.04$	$1.06^{c} \pm 0.01$	$1.61^{c} \pm 0.06$	$179.07^{e} \pm 0.16$
Amafulo (amakufulo)	$69.00^{a} \pm 0$	$1.14^{e} \pm 0.03$	$7.03^{f} \pm 0.01$	$17.64^{h} \pm 0.02$	$5.13^{f} \pm 0.04$	$0.06^{a} \pm 0.02$	$187.11^{g} \pm 0.11$

SD=standard deviation. Means with different superscripts in the same column are significantly different ($p < 0.05$). onunu=cooked ripe plantain, casava, yam and palm oil paste, okurufulo = abelmoschus esculentus soup, otira = eba, odorfulo = seafood soup, ofe-ede = colocasia esculenta soup, burufulo = yam peppersoup

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Table 2 shows the micronutrient contents of the identified frequently consumed traditional dishes per 100 g. Vitamin A content was highest in *Amafulo* with *eba* (244.929 (µgRE), while *onunu* with catfish pepper soup had the least (32.229 (µgRE). Folate composition of the dishes ranged from 0.03 mcg in *onunu* and catfish pepper soup to 0.021 mcg in *amafulo* and eba. *Ede* soup with *ogbolo* had the highest iodine content (11,340 µg) while the onunu with catfish pepper soup had the least iodine content (4280 µg). Zinc content of the dishes ranged from 8.33 mg in *ohwe ede etcha* (fufu) to 17.58 mg in *burufulo*. Iron composition of the dishes ranged from 125 mg in *onunu* with catfish pepper soup to 193.77 mg in *ohwe ede etcha* (*fufu*).

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Table 2: Micronutrient contents of foods consumed by preschool children as consumed

Food Samples	Vitamin A (µgRE)	Folate(µg)	Iodine (µg)	Calcium (mg)	Zinc (mg)	Iron (mg)
Onunu and catfish pepper soup	32.2^{a}± 0.531	0.03^{e}± 0.0	4280^{a}±360	802.15^{b}± 14.8	8.42^{a}± 0.08	125^{a} ± 5.88
Okurufulonaotira	158.6^{f}± 2.61	0.014^{b}± 0.0	6550^{c} ± 0.0	2606.9^{f}± 3.54	8.8^{a}±0.58	148.64^{c} ± 2.00
Odorfulo and eba	137.9^{e}±2.271	0.012a±0.0	8320^{f} ±360	2316.9^{e}± 0.0	12.8^{c}± 1.46	168.93^{d} ± 1.71
Ofe-ede and fufu	190.8^{g}±3.141	0.016^{c}± 0.0	9070^{g} ±710	4385.8^{h}± 14.75	13.08^{d}± 0.17	133.80^{b} ± 6.21
Burufulo	49.0^{c}±0.807	0.04^{f} ± 0.0	5540^{b} ± 0.0	400.74^{a}± 4.92	17.6^{e}± 0.25	128.47^{a} ± 0.0
Ohwe ede etcha (fufu)	60.6^{d}± .996	0.05^{g}± 0.0	7560^{e} ± 0.0	2104.17^{d}± 18.54	8.33^{a} ± 0.0	193.77^{e} ± 8.83
Ede soup and Ogbolo(fufu)	44.7^{b} ± 8.06	0.012a±0.0	11340^{e}± 1070	2776.8^{g}± 29.25	11.21^{b}± 0.13	166.68^{d} ± 0.0
Amafulo and eba	244.9^{h}± 4.02	0.021^{d}± 0.0	7310^{d} ±360	1762.64^{c}± 0.0	12.7^{c}± 0.25	131.30^{b} ± 0.21

Values are means ± standard deviations of 3 determinants. values with different superscripts in the same column are significantly different ($p<0.05$).

onunu=cooked ripe plantain, casava, yam and palm oil paste, okurufulo = abelmoschus esculentus soup, otira = eba, odorfulo = seafood soup, ofe-ede = colocasia esculenta soup, burufulo = yam. *$p<0.05$

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Discussion

Proximate composition and energy values of some traditional foods consumed by preschool children (2-5 years) per 100 g.

Energy content of the dishes ranged from 125.34 kcal/100 g in *burufulo* to 187.11 kcal/100 g in *amafulo.* The energy values obtained in these foods were less when compared with the recommended values, however, this is just one of the meals in the day; energy requirement can be made up through other meals taken in the day. The values obtained in this study were less than those obtained from studies on the evaluation of "*mberiagworagwo*" (470.13± 0.90%), a traditional dish consumed by *Uruagu* Nnewi people in Anambra state (Amadi, et al., 2017), o*nunu and mgbam* (499.39±48.73%) consumed by *Ikwerre* people of Rivers State (Amadi et al., 2012).

Moisture content of foods analysed ranged from 69.00g/100g in *Amafulo* being the least to 77.01 g/100g in *burufulo*. However, this might not be possible because of their small stomachs. Moisture content in foods is dependent on the type of dish, the amount of water used in preparation and the ingredients used. It is also an indication of a short shelf life due to microbial spoilage and less concentrated nutrients (Awogbenja et al., 2021). Moisture content influences the taste, texture, weight, appearance and shelf life of the food (Zakpea et al., 2010). *Burufulo* is yam pepper soup hence the high moisture content.

The ash content was highest in *Ofe-ede* with *fufu* (1.23g/100g) and least in *Odorfulo* with *eba* (0.66g/100g). Ash content in foods is an indication of the mineral content of the food. These figures are surprising and disappointing because the main ingredients in *odorfulo* are seafoods which are good sources of minerals such as calcium, zinc, iodine, vitamin A(Hicks et al., 2019), fatty acids and proteins (Golden et al., 2016) which are essential for cognitive function and development, oxygen transport, hormone and metabolism regulation, growth and immune system function.

Protein contents of the dishes ranged from 5.25 g in *okurufulo* to 7.03 g in *Amafulo*to. This is small when compared to the 13 – 19 g/day recommended by WHO for this age group. Adequate protein intake in early life has been shown to positively impact on the height and weight of children 3 to 10 years of age (Uauy et al., 2015). A study conducted in Ghana by Ghosh et al.,

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(2010) also found an association between quality protein intake and the risk of being stunted. Protein also contributes to healthy immune system, improvement of satiety and appetite control (Sumpter et al., 2016).

Fat content of the dishes ranged from 8.30g/100g in *Burufulo* (the least) to 17.64 g/100g in *Amafulo*. These values were less than those obtained from other studies with similar ingredients and preparation such as "*Mgbam*" (36.35±2.32%) and "*Nduduagworagwo*" (18.75 ± 0.06%) as reported by Amadi et al., (2011) and Duru et al., (2012), respectively. The finding in this study is within the range of value reported for "*uha soup*" (10.74 ± 0.05%) by Obiakor, Okeke, Obioha and Onyeneke, (2014). *Amafulo* is particularly high in fat because palm fruit extract, (palmoil) (*Elaeisguineensis*) is used in its preparation. Palmoil is a good source of beta-carotene, it boosts the immune system, improves eyesight, improves neurological development and brain function especially in early childhood and reduces toxins in the body (Ismail et al., 2018). This is why it is widely accepted and included in most Nigerian diets. Dietary fat has been so criticized that its advantages are sometimes ignored. The fact that children and adults need fat in their diets cannot be overemphasized. Dietary fat also supplies essential fatty acids (EFA) and helps in the absorption of fat-soluble vitamins A, D, E and K.

Crude fibre content of the dishes ranged from 0.53 ± 0.04 g /100g in *odorfulo* with *eba* to 5.13 ± 0.04%/100g in *Amafulo*. Fibre is essential in the diet of children to prevent constipation though when consumed in excess can irritate their bowel, hence it should be given to them with caution (Amadi et al., 2017). However, when compared with the values as recommended by WHO (19g/day for ages 1 – 3 and 25g/day for 4 -y 6 year olds), the values obtained in this study are too small, making it inadequate in providing the required levels. According to USDA (2010), children over two years of age should increase dietary fibre intake to an amount equal to or greater than their age; that is their age + 5 g/day. This increases from 8 g/day at age 3 years to 25 g/day by age 20 years. This range is considered safe even for children and adolescents with marginal intakes of some vitamins and minerals.

Carbohydrate content of the foods was low across all foods analysed when compared with the 130g/day as recommended by WHO for this age group. The values ranged from 6.92g/100g in *burufulo* as the highest to 0.04g/100g in *okurufulo as* the least. This was because emphasis is on the quantity of soup which always almost doubles the *eba* or *fufu*. The carbohydrate in *burufulo*

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is attributed to its main ingredient which is yam (*dioscoreaspp)* from the root and tubers food group. The carbohydrate contents of most of these foods (apart from *onunu* and *burufulo*) were mainly from the *"garri* and *fufu"* eaten with the soup and the cocoyam used in thickening the soup. Preschool children like all other children are naturally inclined to be very active hence the need for constant supply of energy especially from carbohydrates because it is the body's preferred source of energy used to support bodily mechanisms and physical activity (Awogbenja et al., 2021).

The micronutrient (vitamin A, folate, iron, iodine, zinc, folate and calcium) content of the identified frequently consumed traditional dishes.

Amafulo with *eba*" ($244.929^{g} \pm 4.02$) was the only food that met the recommended dietary allowance for vitamin A for the age group under study (200-400 mcg daily) (WHO/FAO, 2004). This might be due to lack of nutrition education about food preparation and combination of the right ingredients. Similar study was conducted on three indigenous foods consumed by Ngwa people of Abia state; only *akidi* had a vitamin A content of 17.97 ± 0.01mg/100g, while vitamin A was not detected in "*Ofe achara"* and "*akara- igboro"*(Amadi et al., 2018).

All dishes analysed were good sources of zinc, iron, and calcium because they exceeded the recommended allowance which is 3 – 5 mg/day(zinc), 7 – 10 mg/day(iron) and 500 – 800 mg/day (calcium), respectively. This makes them suitable for people of all ages especially the preschoolers who are at a crucial developmental stage. These figures were grossly higher than the ones found in some traditional dishes consumed in Nsukka (Eastern Nigeria) as reported by Davidson et al., (2019); with zinc content ranging from 0.1 mg/100 g in "*okpa"* to 0.4 mg/100 g in "*Igbangwu*" while iron content ranged from 2.0 mg/100 g in "*okpa*" to 2.1 mg/100 g in "*Ayaraya ji*. Similar analysis carried out on twenty-five (25) local foods frequently consumed in Nigeria showed that the top three dishes with high iron contents were rice with beans (24.01 mg/100 g), yam porridge (22.21 mg/100 g) and *eba* with *okazi* (19.55 mg/100 g) (Morakinyo, Samuel, & Adegoke, 2016). Zinc was highest in *eba* with *okazi* (8.31 mg/100 g), rice with beans (7.39 mg/100 g) as well as *waina* (6.06 mg/100g) (2.19 mg/100 g) (Morakinyo et al., 2016).

The high calcium content of some of these dishes might be linked to the seafoods (fish, periwinkle, prawns, clamps, crayfish) used in preparing these dishes. A similar study conducted on traditional foods consumed by the Ngwa people of Abia State had calcium content range of

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49.03mg/100g in *ofeachara* mixed with *mgbam* and *garri* to 7.92mg/100g in *akidi*. The calcium in "*ofeachara* mixed with *mgbam* and *garri*" could be likened to the constituents of the soup - stockfish and the "*achara*" used for the preparation of the dish (Amadi et al., 2018). Another study conducted by Kayode et al.,(2010) on the micro nutrient content of some selected indigenous soups in Nigeria reported different concentration of calcium. In the south-south region, "*Afang*" soup was observed to have the highest concentration of calcium (850±5.00 mg/100 g) with "*edikang-ikong*" having the lowest concentration (120±2.52 mg/100 g). In the South-East, very low concentration of calcium was observed in "*Egusi + ugu*" (4.00±0.31 mg/100 g), while "*onugbu*" had the highest concentration (320±1.15 mg/100 g). In the Southwest zone, "*soko*" had the highest concentration of calcium (500±1.15 mg/100 g), "*gbegiri*" had the lowest (75.0±1.52 mg/100 g). Northern region recorded groundnut vegetable soup as having the highest concentration of calcium (190±2.64 mg/100 g), while beans vegetable and groundnut had the least values of calcium at the same concentration of 90.0±1.15 mg/100 g. The recommended intake for preschool children is 500-800 mg/day (FAO/WHO, 2001).

The folate content of all foods analysed were very low in comparison with recommended values (150 – 200 mcg). This is an indication of poor consumption of fruits and green leafy vegetables which are known to be good sources of folate. Another reason could be that most of these traditional leafy green vegetables (TGLV) are actually consumed but the preparation process of cutting and washing them before they are cooked causes leaching of all the folate contents as opined by Delchier et al., (2016). Overcooking vegetables can also destroy its folate content. Folate is essential in synthesis of amino acids, aids the production of red blood cells and facilitates quick cell growth in children. Other traditional foods analysed in similar studies also had low folate levels; 10.95 mcg/100g (Ukam, et al., 2020)), 3.06 mcg/100g (Aburime et al., 2019) and 3.1 mcg/100g - 18.7 mcg/100g (Okeke et al., 2009)).

Iodine content of foods in this study ranged from 4280±360mcg/100g (the least) in *onunu* with catfish pepper soup to 11340 ± 1070 mcg/100g (the highest) in *ede* soup with *ogbolo.* The iodine content of these foods exceeded the recommended values – 90 mcg/day. This can be attributed to the seafoods used in preparing most of these foods in this study. This implies that iodine deficiency may not be a problem in the study area. A study on twenty three frequently consumed foods in Zaria metropolis reported lower iodine content of foods ranging from 62.06mcg/100g in

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fried beans with pap to 2056.23mcg/100g in *tuwon masara* with dry okra sauce (Tukur et al., 2014). Another study conducted in Ijebu North Local Government Area of Ogun State, Nigeria also reported that the iodine content of the fruits and vegetables significantly varied with the highest content observed in plantain *(M. paradisc*) 258.83 ± 11.43 mcg / 100 g to 2.43±0.01mcg / 100 g in grapes *(Citrus paradise*) among the six fruits analysed, while among the five vegetables analysed tete *abalaye* (*Amaranthus hubridus*) had the highest iodine value of 58.36 ± 1.88 mcg/100g and the least value was observed in *Ugu* (*Teleferia occidentalis*) 23.94 ± 1.88 mcg/100g (Salau et al., 2011).

Conclusion

The frequently consumed traditional dishes analysed contained adequate amounts of energy, macronutrients and micronutrients that are of public health concern to preschool children except folate which was much lower than recommended reference values. Calcium in *burufulo* was also less than the reference value (800 mg). Owning ruminants and fishpond primarily for consumption will also be of nutritional and economic benefits for the household. These factors if carefully considered in nutrition intervention will give children access to micronutrient-rich foods, combat malnutrition and achieve the sustainable development goal 2 (Zero hunger) before 2030.

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