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Nutrients and Phytochemical Composition of three Commonly Consumed Local Dish in Ohaji Egbema Local Government, Imo State

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Abstract

Background: Nutrient and phytochemical analysis plays a crucial role in understanding the nutritional composition and potential health benefits of traditional dishes.
Aim: The nutritional and phytochemical properties of three commonly consumed local dishes in Ohaji Egbema Local Government Area, Imo State, were investigated.
Materials and Methods: Three samples were analyzed: oha soup with eba, ukazi soup with fufu, and ugba. The samples were examined for mineral content (calcium, iodine, and iron), vitamins (Vitamin A, C, and E), phytochemicals (lignans, flavonoids, and phytoestrogens), and proximate composition (moisture, carbohydrate, fat, protein, crude fiber, and ash) using standard analytical methods.
Results: The highest and lowest vitamin C levels were recorded in oha soup with eba (97.70±4.67 mg/100 g) and ukazi soup with fufu (28.40±2.26 mg/100 g), respectively ($p<0.05$). Ugba had the highest levels of pro-vitamin A (1429.84±272.00 IU), vitamin E (21.79±0.61 mg/100 g), protein (18.25±0.35%), fat (22.25±0.35%), iodine (25.50±1.0 mg/100 g), and lignans (20.69±0.96 mg/100 g) ($p<0.05$). The lowest levels of protein (9.41±0.58%), iodine (12.84±0.87 mg/100 g), vitamin E (6.36±0.73 mg/100 g), lignans (7.58±0.27 mg/100 g), phytoestrogens (1.03±0.08 mg/100 g), and flavonoids (0.96±0.09 mg/100 g) were recorded in ukazi soup with fufu ($p<0.05$).
Conclusion: The local dishes, particularly oha soup with eba and ugba, were rich in protein, pro-vitamin A, vitamin E, iodine, vitamin C, and lignans. These dishes may serve as adequate dietary options for the treatment of protein-energy malnutrition and are good sources of antioxidants for the management of cancer.

Keywords: *Nutrients, Phytochemical, Local Dishes, Oha soup, Ukazi, Ugba, Flavonoids*

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1. Introduction

Nutrients are substances present in food that are essential for the growth, development, and maintenance of the human body. Nutrients include carbohydrates, proteins, fats, vitamins, minerals, and water. Phytochemicals are bioactive compounds found in plants that are not considered essential nutrients but have potential health benefits. Phytochemicals are responsible for the color, taste, and aroma of plants and are associated with various health-promoting properties. Local dishes are traditional or regional culinary preparations that are commonly consumed within a specific geographic area. These dishes often reflect the local culture, ingredients, and cooking techniques of a particular region.

The study of the nutrient and phytochemical composition of commonly consumed dishes is essential for understanding their nutritional value, potential health benefits, and contributions to overall dietary patterns (WHO 2020). Local dishes, often prepared using traditional recipes and ingredients, play a significant role in cultural heritage, culinary traditions, and community health (Ogunka-Nnoka & Ijeh, 2018). In Ohaji Egbema Local Government, Imo State, Nigeria, where dietary practices are deeply rooted in local culture and agricultural resources, exploring the nutritional composition of staple dishes holds particular relevance.

According to the World Health Organization (WHO), Nigeria faces a dual burden of malnutrition, with both under nutrition and diet-related non-communicable diseases posing significant public health challenges (WHO 2020). Therefore, assessing the nutritional quality of commonly consumed dishes in specific regions like Ohaji Egbema is crucial for informing targeted interventions to address malnutrition and promote healthy eating habits.

Previous studies have highlighted the rich biodiversity of food crops and culinary diversity in Nigeria, emphasizing the need to document and analyze the nutritional composition of traditional dishes (Adeyeye *et al.*, 2019). Additionally, the phytochemicals present in local ingredients have attracted attention for their potential health-promoting properties, including antioxidant, anti-inflammatory, and anti-cancer effects.

By examining the nutritional content and bioactive compounds present in these dishes, this research seeks to provide valuable insights into their potential health benefits and contribute to evidence-based dietary recommendations for improved nutrition and health outcomes in Ohaji Egbema and similar communities. Despite the cultural and nutritional significance of local dishes, there is limited scientific research on their nutrient and phytochemical composition, particularly in rural areas such as Ohaji Egbema. Therefore, this study aims to fill this gap by investigating the nutrient and phytochemical profiles of three of the most commonly consumed dishes in the local community.

When examining the nutrients and phytochemical composition of three commonly consumed local dishes in Ohaji Egbema, Imo State—Ukazi soup with fufu, Oha soup with garri, and Ugba—it's vital to explore their cultural significance and context. Local cuisine not only provides sustenance but also serves as a reflection of the region's agricultural practices, culinary traditions, and cultural heritage (Ogbonna *et al*., 2019).

Ukazi soup, made with the leaves of the *Gongronema latifolium* plant, is often paired with fufu, a staple carbohydrate dish made from cassava flour. This combination offers a balance of nutrients, with the soup providing essential vitamins and minerals from the Ukazi leaves, while fufu offers carbohydrates for energy (Uzochukwu *et al.*, 2016). The preparation and consumption of Ukazi soup and fufu are deeply rooted in the cultural practices of the community, often enjoyed during social gatherings and festive occasions.

Similarly, Oha soup, prepared with Oha leaves and assorted meats or fish, is commonly served with garri, a staple food made from cassava. Oha soup is rich in vitamins and minerals, particularly vitamin C and iron from the Oha leaves, while garri provides carbohydrates and some essential nutrients (Uzochukwu *et al.*, 2016). The combination of Oha soup and garri reflects the culinary traditions and dietary preferences of the local population, highlighting the importance of locally sourced ingredients in traditional dishes.

Ugba, a popular delicacy in the region, is made from fermented African oil bean seeds and often served as a side dish or snack. It is rich in protein, healthy fats, and phytochemicals such as flavonoids and saponins, which have antioxidant and anti-inflammatory properties (Ogbonna *et al*., 2019). The consumption of Ugba is deeply ingrained in the cultural fabric of the community, symbolizing both culinary expertise and social bonding during communal gatherings.

The study of the nutrients and phytochemical composition of Ukazi soup with fufu, Oha soup with garri, and Ugba provides insights into the intersection of food, culture, and health in Ohaji Egbema, Imo State. By understanding the cultural significance of these dishes and promoting their consumption, communities can preserve their culinary heritage while promoting nutrition and well-being.

Nutrient and phytochemical analysis plays a crucial role in understanding the nutritional composition and potential health benefits of traditional dishes like Ukazi soup and fufu, Oha soup and garri, and Ugba in Ohaji Egbema Local Government, Imo State. This analysis involves the quantitative assessment of macro and micronutrients, as well as bioactive compounds present in these dishes, providing valuable insights into their nutritional value and contributions to overall dietary patterns and health outcomes.

Nutrient analysis involves determining the levels of macronutrients (e.g., carbohydrates, protein, fat) and micronutrients (e.g., vitamins, minerals) in the dishes. For example, a study by Ogunka-Nnoka and Ijeh (2018) on the nutrient composition of *Tetracarpidium conophorum* seeds highlighted the presence of essential nutrients such as protein, fat, carbohydrates, vitamins, and minerals, which contribute to the nutritional value of the food.

Phytochemical analysis focuses on identifying and quantifying bioactive compounds present in plant-based foods, including flavonoids, phenolic compounds, carotenoids, and alkaloids. These phytochemicals have been associated with various health benefits, including antioxidant, anti-inflammatory, and anti-cancer properties. Research by Adeyeye *et al*. (2019) on *Brachystegia eurycoma* seeds demonstrated the presence of phytochemicals such as flavonoids and phenolic compounds, which contribute to the antioxidant capacity and potential health-promoting effects of the seeds.

Nutrient and phytochemical composition may vary depending on factors such as ingredient sourcing, preparation methods, and cooking techniques. Therefore, it is essential to consider these factors when conducting analysis and interpreting results. For instance, differences in the cooking time, temperature, and processing methods can affect the bioavailability of nutrients and phytochemicals in the dishes.
Understanding the nutrient and phytochemical composition of local dishes has significant health implications for the community. By identifying the presence of essential nutrients and bioactive compounds, researchers can assess the potential health benefits of consuming these dishes and make evidence-based recommendations for dietary intake. Additionally, knowledge of nutrient deficiencies or excesses in the diet can inform interventions to address malnutrition and promote overall health and well-being in the community.

Nutrient and phytochemical analysis provides valuable information about the nutritional composition and potential health benefits of traditional dishes like Ukazi soup and fufu, Oha soup and garri, and Ugba in Ohaji Egbema Local Government, Imo State. By conducting systematic analysis, researchers can gain insights into the nutritional value of these

dishes and their contributions to dietary diversity, nutritional adequacy, and community health.

Investigating the nutrients and phytochemicals in Ukazi soup and fufu, Oha soup and garri, and Ugba in Ohaji Egbema, holds valuable insights into the health and nutritional implications of these commonly consumed local dishes. Let's delve into the potential health benefits and drawbacks associated with each:

Ukazi leaves are rich in vitamins A, C, and E, known for their antioxidant and anti-inflammatory properties (Akindayo *et al*., 2007). They may also aid digestion and boost the immune system (Akindayo *et al*., 2007). Fufu (made from cassava) are good source of energy due to its complex carbohydrates (Akoroda, 2009). Fufu can be high in calories, especially when consumed in large quantities. Consider portion control for weight management. Cassava improper processing methods can leave behind harmful toxins. Ensure thorough processing and consumption of well-prepared fufu.

Oha leaves are excellent source of vitamins A, C, and K, essential for bone health, vision, and immunity (Ugochukwu *et al*., 2013). They also possess antioxidant and anti-inflammatory properties (Ugochukwu *et al*., 2013).
Garri provides readily available energy due to its simple carbohydrates (Akoroda, 2009). It is also gluten-free, making it suitable for individuals with gluten intolerance.

Garri are low in protein and some essential nutrients. Combining it with protein-rich sources like beans or meat is crucial for a balanced diet. Garri can cause blood sugar spikes, especially for individuals with diabetes or prediabetes. Consider portion control and consumption with other foods to moderate its glycemic impact.

Ugba seeds are an excellent source of plant-based protein, essential for building and repairing tissues (Ihedioha *et al*., 2014). Ugba contains healthy fats like omega-3 and omega-6, beneficial for heart and brain health (Ihedioha *et al*., 2014). Ugba contributes to gut health and digestion due to its fiber content (Ihedioha *et al*., 2014). Some people may find the taste and smell of Ugba unpalatable. Ugba seeds are susceptible to spoilage if not processed and stored properly. It is important to remember that these are general implications, and individual health needs and responses to these foods can vary. Consulting a healthcare professional or registered dietitian for personalized dietary advice is always recommended.

2. Materials and Methods

Area of the Study

This study was conducted in Ohaji Egbema Local Government, Imo State. Ohaji-Egbema is an oil-rich Local Government Area of Imo State, Nigeria. It is headquartered in Mmahu-Egbema. Ohaji-Egbema Local Government Area as presently constituted was created by Gen. Ibrahim Babangida's administration in the August 27, 1991 presidential proclamation, created out of the former Ohaji/Egbema/Oguta LGA. Ohaji/Egbema comprises three political districts: Ohaji East, Egbema North, and Ohaji West. The Ohaji-Egbema local government has seventeen autonomous communities, namely Egbema, Umuagwo, Oloshi, Umunkwaku, Obile, Obitti, Mgbirichi/Alakuru, Opuoma, Assa, Awarra, Ikwerede, Umuokanne, Obiakpu, Ohaba, Obosima, Mmahu, and Obuomadike. The local council lies in the south-western part of Imo State. It shares common boundaries with Owerri in the East, Oguta LGA in the North and Ogba/Egbema/Ndoni in Rivers State in the South-west (Victor E. 2012).

Design of the Study

For the purpose of achieving the objectives of the study, an experimental design was adopted for this study.

Data Collection Methods

A list of commonly consumed dishes was compiled from focus group conversations with some Ohaji Egbema women and moms. Ten person's participated in each focus group. At each household/event, one focus group was formed. The discussions were scheduled for convenient times and days. The topics of discussion included a list of frequently consumed items, the components needed to prepare them, and the preparation techniques. If a food was consumed three times or more per week, it was considered commonly consumed, whether it was a single food or a composite dish.

The women were informed about the purpose of the study and asked if they would be willing to participate. All the women chosen for the study provided their informed consent.

Three different samples each of the commonly consumed foods were bought from the market. In all, nine samples of three identified commonly consumed foods were obtained from the market and these were analyzed chemically. The Official methods of the Association of Analytical Chemists (AOAC) were used to determine the values for proximate composition (moisture, crude protein, ash, crude fiber, and crude fat) of the respective foods. Carbohydrate was determined by difference. Iron, calcium, iodine and phosphorus and Vitamin A content in the samples were determined by the methods described by AOAC.

Sample preparation

The samples were already cooked for consumption

Sample identification

The samples were identified at the analytical laboratory of the Department of Nutrition and Dietetics, University of Nigeria, Nsukka.

Methods of Data Collection

The questionnaire was distributed to the focused group, explaining the purpose of the research and soliciting their maximum co-operation. The researcher personally administered the questionnaire.

Experimental Procedure

Twenty (20) participants were used to carry out focused group discussion. Their age group was between the ages of 20 and 50 years, 15 females and 5 males. Eleven (11) participants were married, 15 participants had both WAEC and B.Sc. while 5 participants had M.Sc. As for occupation, 10 were business

owners (mostly traders), 6 were civil servants while 4 were students.
During the interview, three (ukazi soup and fufu, oha soup and eba, and ugba) most commonly consumed local dishes were selected.

Nutrient Analysis
Analytical procedures
The proximate composition (moisture, carbohydrate, fat, protein, crude fiber, and ash), micronutrients (calcium, iodine, iron, vitamin C, E and pro-vitamin A) minerals (calcium, iodine and iron), vitamins (Vitamin A C and E), phytochemicals (lignans, flavonoids and phytoestrogens) and proximate (moisture, carbohydrate, fat, protein, crude fiber, and ash) were determined according to the Association of Analytic Communities method.

3. Results and Discussion

Proximate composition of three commonly consumed local dish in Ohaji Egbema Local Government Area, Imo State
The proximate compositions of three commonly consumed local dish in Ohaji Egbema Local Government Area, Imo State are shown in Table 1.

Table 1: Proximate compositions of the samples

Parameter (%)	*A*	B	C
Moisture	61.30^{a}±0.26	59.00^{b}±0.28	54.68^{c}±0.37
Protein	9.67^{b}±0.92	9.41^{b}±0.58	18.25^{a}±0.35
Fat	3.05^{c}±0.21	5.5^{b}±0.64	22.25^{a}±0.35
Crude Fibre	3.07^{a}±0.16	3.16^{ab}±0.08	2.50^{b}±0.42
Ash	0.46^{b}±0.07	0.96^{a}±0.02	1.67^{b}±0.11
Carbohydrate	21.74^{a}±1.19	21.95^{a}±1.53	1.75^{b}±2.21

Reported value are means ± standard deviation of samples. Means with different superscripts in the same row are significantly difference ($p<0.05$). Sample A = oha soup mixed with eba, sample B = utazi soup mixed with fufu and sample C = ugba.

Moisture Content
The moisture content of the samples varied significantly ($p<0.05$) between 54.68 and 61.30 % as seen from 4.1. Sample A (oha soup mixed with eba) recorded the highest value of moisture content while sample C (ugba) had the least moisture content. The results revealed that the dishes contain high moisture content and this may be attributed to the volume of water used in their preparation as the Nigerian soups chemical analysis were conducted as eaten. High moisture in foods is an indicator of high-water activity and this enhances microbial action making the foods susceptible to microbial spoilage at room temperature (Ponka *et al*., 2016). The moisture content of the local dishes were comparable to 56.67 to 67.64 % reported by Akinbule *et al*. (2021) for Selected soup and dishes (oha soup, ukazi soup and ogbono soup) but lower than 65.67-68.56 % reported for traditional soups consumed in Igbere community in Bende local government area, Abia State (Obiakor-Okeke *et al*, 2014).

Protein Content
The protein content of the local dishes was high in ugba (sample C) and low in ukazi soup mixed with fufu (sample B). The results obtained in this study range from 9.41-18.25 %. Samples C (ugba) was significantly higher ($p<0.05$) than sample A (oha soup + eba) and sample B (ukazi mixed with fufu). However, there was no significant difference ($p>0.05$) between sample A (oha soup mixed with eba) and sample B (ukazi soup mixed with fufu). The high protein content in sample C (ugba) could be attributed to the basic ingredient ugba, While that of oha soup mixed with garri (sample A) and ukazi mixed with fufu (sample B) could be attributed to the protein content ingredient stocked fish, red meat and crayfish used in the preparation of the traditional diet. Okonkwo and Alor (2022) reported high protein content in ugba. The protein content of the local dishes were lower than the values obtained by Iheanacho and Angela (2019) for leafy vegetables consumed in Imo State (19.67-32.95 %) but much higher than 1.22-5.91 % reported for three selected traditional diet consumed by Ngwa people in Abia State (Benjamin *et al*., 2019). From the results obtained in this study, it can be concluded that the local dishes consumed by Ohaji Egbema people are rich in protein content. This suggests that habitual consumption of these soups and dishes in adequate portions promote consumption of complete protein and reduce the chances of having protein energy malnutrition (Akinbule *et al*., 2022).

Fat Content
The total fat content of the oha soup mixed with eba (sample A) and okazi soup mixed with fufu were low however, ugba (sample C) contain considerably moderate fat content. Statistically the fat content of ugba (sample C) was significantly higher ($p<0.05$) than oha soup mixed with eba (sample A) and okazi soup mixed with fufu. The fat content of the local dishes ranged from 3.05-10.25 % with sample A (oha soup mixed with eba) having the least fat content while sample C (ugba) recorded the highest fat content. The results obtained in this study were lower than 6.03-14.28 % reported for selected soup and dishes (oha soup, ukazi soup and ogbono soup) by Akinbule *et al*. (2022) but comparable to the results obtained by Obanla *et al*. (2016) for Standardized Soups and Dishes Commonly Consumed in Nigeria (3.74-11.22 %). Although, dietary fat play important role in gastric emptying and intestinal motility, satiety, provides essential fatty acid and facilitate the absorption of lipid soluble vitamins (Vishwanath, 2012 and Food and Agriculture Organization, 2010), excessive consumption of dietary fat has been associated with the risk of obesity, cardiovascular diseases and many non-communicable diseases (World Health Organization 2014 and International Food Policy Research Institute 2016). This suggests that consumption of oha soup mixed with gari, ukazi mixed with fufu and ugba dishes may have positive health implication with reference to dietary fat and may not pose adverse health risks since the fat content is not high.

Fibre Content
The fibre content of the local dishes commonly consumed by Ohaji Egbema people of Imo State varied between 2.5-3.70 %. Sample C (ugba) had the least fibre content while sample A (oha soup mixed with fufu) had the highest fiber content. Sample A (oha soup mixed with fufu) was significantly ($p<0.05$) higher than sample C (ugba). However, there was no significant difference ($p>0.05$) among samples, sample A (oha soup mixed with gari) and sample B (okazi soup mixed with

fufu) and sample B (okazi soup mixed with fufu) and Sample C (ugba) respectively. The difference in the fibre content of sample A (oha soup mixed with eba) and sample B (okazi soup mixed with fufu) when compared to sample C (ugba) could come from the vegetable used during preparation of oha soup and okazi soup since vegetables are good source of fiber (Fayet-Moore *et al*., 2018 and Clemens *et al*, 2012). The fibre content of ugba obtained in the study were similar to 2.13 % obtained for ugba reported by Okonkwo and Alor (2022). However the results were higher than 0.29-1.40 % reported for oha, ukazi and ogbono soup (Akinbule *et al*., 2022) but lower than 3.16-13.70 % reported for leafy vegetables (Iheanacho and Udbuaeni, 2019). Although, crude fibre does not give the true fibre content of foods as dietary fibre which was not determined in this study as crude fibre is determined using sulfuric acid and sodium hydroxide solution treatment that dissolves more than 50 % of the fibre in foods. However, information on the crude fibre contents of these foods can give an idea of the dietary fibre contents of the foods (Akinbule *et al*., 2022). Fibre in foods have been reported to play a major role in the prevention of chronic diseases such as hypertension (Evans *et al*., 2915), diabetes (The InterAct Consortium, 2015 and Yao *et al*., 2014), cardiovascular disease risk (Bupathiraju *et al*., 2014 and Yao *et al*., 2014), obesity (Foge *et al*., 2012), cancer (Threapleton *et al*., 2013) and stroke (Shay *et al*., 2012). The Nigerian soups and dishes observed to have higher crude fibre contents might be of good health benefit to consumers, particularly against diet-related non-communicable diseases.

Ash Content

Ash content of the local dishes ranged from 0.46-0.96 % with sample B (ukazi soup mixed with fufu) having the highest ash content while sample A (oha soup mixed with eba) had the least ash content. Sample B (ukazi soup mixed with fufu) was significantly higher than sample A (oha soup mixed with eba) and sample C (ugba). However there was no significant difference ($p>0.05$) between sample A (oha soup mixed with eba) and sample C (ugba). The ash content of ugba (sample C) obtained in the study was lower than 2.65-3.99 % reported for ugba by Okonkwo and Alor (2022). The difference in their ash content could be difference in processing method (Pastorino *et al*., 2016). The ash content of the local dishes commonly consumed by Ohaji Egbema people of Imo State were lower than 1.5-1.8 % reported for ukazi soup commonly consumed in Umuahia, Abia State, Nigeria (Adepoju *et al*., 2022). Ash content has been reported to be an indication of higher nutrient quality, especially minerals (Adepoju *et al*., 2022).

Carbohydrate Content

The carbohydrate content of the local dishes varied between 14.75-21.95%. Sample B (ukazi soup mixed with fufu) recorded the highest carbohydrate (21.95 %) content while sample C (ugba) had the least carbohydrate content (14.75 %). There was no significant difference ($p>0.05$) between sample A (oha soup mixed with eba) and sample B (ukazi soup mixed with fufu) but sample A (oha soup mixed with eba) and sample B (ukazi soup mixed with fufu) were significantly ($p<0.05$) higher than sample C. The high value of carbohydrate content of sample A (oha soup mixed with eba) and sample B (ukazi soup mixed with fufu) compared to sample C (ugba) could come from eba and fufu mixed with oha and ukazi because they are good source of carbohydrate food. (Ayankunbi *et al*., 2019). The results were within the range reported by Adepoju *et al*. (2022) for ukazi soup commonly consumed in Umuahia, Abia State, Nigeria (27.00-28.9 %).

Carbohydrates play a role in energy metabolism and homoeostasis (Ponka *et al*., 2016; Vishwanath, 2012). They serve as source of energy for all body functions, particularly brain functions and are necessary for the metabolism of other nutrients (Ludwig *et al*., 2018; Zhang *et al*., 2018 and Lamothe *et al*., 2019).

Mineral Composition of Three Commonly Consumed Local Dish in Ohaji Egbema Local Government Area, Imo State

The mineral compositions of three commonly consumed local dish in Ohaji Egbema Local Government Area, Imo State are shown in Table 2.

Table 2: Mineral compositions of the samples

Parameter (mg/100g)	A	B	C
Calcium	40.00^{ab}±0.00	54.80^{a}±10.74	20.8^{b}±1.13
Iron	5.62^{b}±0.03	6.30^{b}±0.42	9.72^{a}±0.06
Iodine	22.98^{a}±1.22	12.84^{b}±0.87	25.50^{a}±1.01

Reported value are means ± standard deviation of samples. Means with different superscripts in the same row are significantly difference ($p<0.05$). Sample A = oha soup mixed with eba, sample B = utazi soup mixed with fufu and sample C = ugba.

Calcium Content

The calcium content of the dishes varied between 20.80-54.80 mg/100g. Sample C (ugba) had the least calcium content while sample B (ukazi soup mixed with fufu) had the highest calcium content. Sample B (ukazi soup mixed with fufu) was significantly ($p<0.05$) higher than sample C (ugba) but significant difference ($p>0.05$) does not exist between samples A (oha soup mixed with eba) and B (ukazi soup mixed with fufu) and between A (oha soup mixed with eba) and C (ugba) respectively. The results were lower than 200.00-310.00 mg/100g reported for ukazi soup commonly consumed in Umuahia, Abia State, Nigeria (Adepoju *et al*., 2022) but higher than 12.8 -26.40mg/100g reported for leafy vegetables consumed in Imo State (Iheanacho Kizito and Udbuaeni, 2019). The RDI of calcium for people four years old and above is 1000 mg/day (FDA, 2015), this indicates that the samples are low in calcium and needs to be combined with calcium rich foods such as dairy product, bone meals, fortified soy beverages, etc. in order to meet the daily requirement for calcium. Calcium is known to be helpful in the formation on strong bones and teeth.

Iron Content

The iron content of the dishes ranged from 5.62-9.72 mg/100g. Sample C (ugba) recorded the highest iron content while sample A (oha soup mixed with eba) recorded the least iron content. Sample C (ugba) was significantly higher than sample A (oha soup mixed with eba) and sample B (ukazi soup mixed with fufu). However, there was no significant difference ($p>0.05$) between sample A (oha soup mixed with eba) and sample B (ukazi soup mixed with fufu). The iron content of the dishes consumed in Ohaji Egbema were lower than 65.25-

87.50 mg/100g reported for leafy vegetables commonly consumed in Imo State (Iheanacho Kizito and Udbuaeni, 2019). Compared to the RDI of iron for men aged 19-50 years (8mg/day) and for women of the same age bracket (18mg/day) (National Academy of Science, 2008), indicating that sample C (ugba) meet the recommended daily intake for men within the age of 19-50 years. Iron facilitate the oxidation of biomolecules to control obesity, which predisposes an individual to various diseases. It is also essential for hemoglobin formation (Thomas and Krishnakumari, 2015).

Iodine Content

Iodine value varied between 12.84-25.50 mg/100g. Sample C (ugba) recorded the highest iodine value while sample B (ukazi soup mixed with fufu) recorded the least iodine content. Sample A (oha soup mixed with eba) and C (ugba) were significantly ($p<0.05$) higher than sample B (ukazi soup mixed with fufu) but there was no significant difference ($p>0.05$) between sample A (oha soup mixed with eba) and C (ugba). The iodine content of the dishes were higher than 9.18- 10.56 mg/100g reported for Green Leafy Vegetables Consumed In Tiv Community, Benue State Nigeria. Compared to the RDI of iodine for children aged 1-18 years (90 µg/day-150 µg/day), for pregnant women within the age of 14-50 years (160 µg/day-220 µg/day), for adults men and women within the age of 19-70 years (100 µg/day-150 µg/day), this shows that the iodine content of the dishes meet the recommended daily intake. Iodine is need to make the thyroid hormones thyroxine and triiodothyronine, which assist with the creation of proteins and enzyme activity, as well as regulating normal metabolism.

Vitamin Composition of Three Commonly Consumed Local Dish in Ohaji Egbema Local Government Area, Imo State

The vitamin compositions of three commonly consumed local dish in Ohaji Egbema Local Government Area, Imo State are shown in Table 3 below.

Table 3: Vitamin compositions of the samples

Parameter	A	B	C
Vit .C (mg/100g)	97.70^{b}±4.67	28.40^{b}±2.26	46.16^{a}±2.49
Pro-Vit.A (IU)	665.71^{b}±19.19.90	642.73^{b}±80.27	1429.84^{a}±272.00
Vit. E (mg/100g)	12.32^{b}±0.72	6.36^{c}±0.73	21.79^{a}±0.61

Reported value are means ± standard deviation of samples. Means with different superscripts in the same row are significantly difference ($p<0.05$). Sample A = oha soup mixed with eba, sample B = utazi soup mixed with fufu and sample C = ugba, Vit = vitamin

Vitamin C Content

Vitamins are indispensable natural substances that are required in minute concentrations in the diets for normal functioning of the body, growth and maintenance of body tissue (Wardlaw *et al.*, 2017). The vitamin C content of the dishes ranged from 28.40 mg/100g. Sample A (oha soup mixed with eba and C (ugba) were significantly ($p<0.05$) higher than sample B (ukazi soup mixed with fufu). No significant difference ($p>0.05$) existed between sample A (oha soup mixed with eba) and sample C (ugba). Sample A (oha soup mixed with eba) had the highest vitamin C content while sample B (ukazi soup mixed with fufu) recorded the lowest vitamin C content. The results were much higher than 12.01-14.62 mg/100g reported for three selected traditional diets consumed by Ngwa People in Abia State, Nigeria (Osuoha *et al*., 2018) but comparable to 21.71-41.07 mg/100g reported by Obiakor *et al*. (2014) for traditional soups consumed in Igbere community in Bende local government area, Abia State, Nigeria. Compared to the WHO (1991) RDA of vitamin C for adults (45mg/day), this indicates that sample A (oha soup mixed with eba) and sample C (ugba) are good source of vitamin C thus will help in protection against immune system deficiencies, cardiovascular disease, prenatal health problems, eye disease, and even skin wrinkling.

Vitamin A Content

The vitamin A content of the dishes varied from 642.73-1429.84 Iµ. Sample C (ugba) had the highest vitamin A content while B (okazi soup mixed with fufu) had the lowest vitamin A content. Sample C (ugba) was significantly ($p<0.05$) higher than sample A (oha soup mixed with eba) and sample B (okazi mixed with fufu). There was no significant difference ($p>0.05$) between sample A (oha soup mixed with eba) and sample B (okazi mixed with fufu). The results obtained in this study is within the range 521.02-649.23 mg/100g reported by Obiakor *et al*. (2014) for traditional soups consumed in Igbere community in Bende local government area, Abia State, Nigeria. The results obtained in this study revealed that sample C (ugba) is a better source of vitamin E. Vitamin E according to research is a fat soluble antioxidants which protects low density lipoprotein against peroxidation (Yokozawa *et al*. 2002). The high amount recorded in this study suggests that the consumption of these dishes could help fight off free radicals associated with cancer.

Vitamin E Content

Vitamin E content of the samples varied from 6.36-21.79 mg/100g. Sample B (ukazi soup mixed with eba) had the least content of vitamin E (6.36 mg/100g) while sample C (ugba) had the highest vitamin A content (21.78 mg/100g). There were significant difference ($p<0.05$) in the vitamin A content of the samples. The results from this study were much higher than 2.445-2.675 IU/100g reported by Onabanjo *et al*., (2010) for some standardized Nigerian composite dishes but similar to 9.67-22.91 mg/100g reported by Awogbenga and Ugwuona (2912) for traditional dishes consumed in Nasarawa State. The results were within the RDI (Miltan *et al*., 2014) of vitamin E (10 mg tocopherol/100g). Thus, sample A and sample C can be adjudged a good source of vitamin E whose intake might function as antioxidant, its role in anti-inflammatory processes, its inhibition of platelet aggregation and its immune-enhancing activity. (Ifemeje *et al.*, 2020). Flavonoids are important water-soluble antioxidants and free radical scavengers that prevent oxidative cell damage, lower the risk of heart diseases, and have strong anticancer activity (Tanwar and Ranji, 2012).

Phytochemical Composition of Three Commonly Consumed Local Dish in Ohaji Egbema Local Government Area, Imo State

The phytochemical compositions of three commonly consumed local dish in Ohaji Egbema Local Government Area, Imo State are shown in Table 4.4 below.

Table 4: phytochemical compositions of the samples

Parameters(mg)	A	B	C
Lignans	9.47^{b}±0.42	7.58^{c}±0.27	20.69^{a}±0.96
Phytoestrogens	1.06^{a}±0.00	1.03^{a}±0.08	1.05^{a}±0.05
Flavanoid	138^{b}±0.44	0.96^{b}±0.09	12.12^{a}±1.02

Reported value are means ± standard deviation of samples. Means with different superscripts in the same row are significantly difference ($p<0.05$). Sample A = oha soup mixed with eba, sample B = utazi soup mixed with fufu and sample C = ugba.

Lignans Content

Lignans Content of the dishes ranged from 7.58-20.09 mg/100g. Significant difference ($p<0.05$) existed among the samples with sample B (ukazi soup mixed with fufu) having the lower value of lignans while sample C (ugba) had the highest lignans. The results obtained in this study were much higher than 0.00389 mg/100g reported for carrot, 0.0024 mg/100g for green and 0.000037 mg/100g for spinach (Carmen *et al*., 2019). From this finding it can be concluded that the dishes are good sources of lignans and this could come from the vegetables used during the soup preparations. The chief sources of dietary lignans are various vegetables and fruits, legumes, whole grain cereals and oilseeds (Durazzo *et al*., 2013). Lignans have been shown to have antioxidant and anti-inflammatory properties may help reduce risk of certain cancers, such as breast, prostate, and colon cancer (Durazzo *et al*., 2013).

Phytoestrogens Content

Phytoestrogens Content of the samples varied between 1.03-1.05 mg/100g. Sample B (okazi soup mixed with fufu) recorded the lowest value of Phytoestrogens and sample A (oha soup mixed with eba) recorded the highest Phytoestrogens Content. However, there was no significant difference ($p>0.05$) between the Phytoestrogens Content of the samples. Phytoestrogens in foods have been suggested to have potential health benefits in reducing the risk of cancer, cardiovascular disease, osteoporosis, and menopausal symptoms (Cornwell and Raskin, 2004 and Thompson, 2002).

Flavanoid Content

The flavanoid Content of the dishes ranged from 0.96-12.24 mg/100g. Sample B (ukazi soup mixed with fufu) had the least value of flavanoid while sample C (ugba) had the highest value of flavanoid. Sample C (ugba) was significantly higher than sample A (oha soup mixed with eba) and B (ukazi soup mixed with fufu). Significant difference ($p>0.05$) does not exist between sample A (oha soup mixed with eba) and B (ukazi soup mixed with fufu). The results were within the range reported by Amadi *et al*. (2017) for Mberiagworagwon traditional food of Uruagunnewi People in Anambra State, Nigeria.

4. Conclusion

By investigating the nutritional and phytonutrient composition of three commonly consumed local dish in Ohaji Egbema Local Government Area, Imo State, this study has shown that local dishes with excellent nutritional and health benefits can be gotten by eating this dishes. The local dishes samples were high in essential nutrients and phytochemicals including iron, Iodine, vitamin A, vitamin E, vitamin C, lignans, but low in calcium and flavanoid. The local dishes (oha soup and eba and ugba) were high in protein, pro-vitamin A, vitamin E, iodine, vitamin C and lignans and will be adequate diets for the treatment of protein-energy malnutrition. These two dishes are also good sources of antioxidants for the management of cancer.

Conflict of interest

The authors declare no conflict of interest.

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