JOURNAL OF OCCUPATION AND TRAINING
FACULTY OF VOCATIONAL AND TECHNOLOGY EDUCATION
ALVAN IKOKU FEDERAL UNIVERSITY OF EDUCATION, OWERRI
VOL. 10 NO. 2 ISSN:2354-2756 OCTOBER , 2026

VITAMIN AND MINERAL COMPOSITION OF TEN COMPOSITE DISHES COMMONLY CONSUMED IN IMO STATE, NIGERIA

LEMCHI STELLA NGOZI
Department of Home Economics and Hospitality Management,
Alvan Ikoku Federal University of Education,
Owerri, Imo State, Nigeria

NGWU ELIZABETH KANAYA
Department of Nutrition and Dietetics,
University of Nigeria, Nsukka, Enugu State, Nigeria

&

MBAH CYNTHIA ADAKU,
Department of Home Economics and Hospitality Management,
Alvan Ikoku Federal University of Education,
Owerri, Imo State, Nigeria

Abstract
The prevalence of non-communicable diseases (NCDs) in Nigeria is rising, partly driven by poor dietary practices and limited nutritional data on traditionally consumed composite dishes. This study determined the vitamin and mineral composition of ten composite dishes commonly consumed in Imo State, Nigeria. Methods: A cross-sectional survey and quasi-experimental design were used. A sample of 396 households across 18 communities (urban and rural) in Imo State was selected using multi-stage sampling. Commonly consumed composite dishes were identified through focus group discussions (FGD) and 24-hour dietary recall. Samples of the ten most frequently consumed dishes were prepared using weighed food recipes. Vitamins (A, B1, B2, B3, B6, B9, B12, C, D, E, K) and minerals (iron, zinc, calcium, iodine, fluoride, sodium) were determined using standard AOAC (2005) analytical methods. The ten most commonly consumed composite dishes were jollof rice (75%), tomato/banga stew (71%), okro soup (67%), beans pottage (65%), egusi soup (65%), vegetable soup (60%), uha soup (58%), moi moi (57%), yam pottage (53%), and Owerri soup (44%). Vitamins A, C, and E were present in appreciable amounts in leafy vegetable-containing dishes. Iron and calcium were most abundant in egusi soup and okro soup respectively. Beans pottage was the richest source of folate. Urban-prepared dishes consistently showed higher vitamin and mineral concentrations than rural counterparts, attributed to socioeconomic differences in ingredient variety and quantity. The composite dishes of Imo State are significant sources of several vitamins and minerals. These findings provide essential baseline data for the Nigerian Food Composition Database and support targeted nutrition education and food-based interventions.
Keywords: Composite dishes, micronutrients, vitamins, minerals, Imo State, Nigeria, food composition, dietary assessment

Introduction
Most foods are eaten in combination rather than singly, these foods usually eaten in combination with other foods are known as composite diets. In Imo State, south-eastern Nigeria, these dishes are prepared mainly from locally available plant-based staples such as cowpea (Vigna unguiculata), maize (Zea mays), yam (Dioscorea spp.), cassava (Manihot esculenta), African oil bean seed (Pentaclethra macrophylla), cocoyams (Colocasia spp. and Xanthosoma mafaffa), plantain (Musa paradisiaca) and rice (Oryza sativa). Here, a composite dish means one made from more than one distinct ingredient drawn from at least three food groups (British Nutrition Foundation, 2015; Sharma *et al.,* 2007).

Vitamins and minerals are indispensable for human health, playing pivotal roles in metabolic regulation, immune function, bone mineralisation, haematopoiesis, neurological function, and antioxidant defence. Micronutrient deficiencies — sometimes referred to as

"hidden hunger" — remain a persistent public health challenge in sub-Saharan Africa, disproportionately affecting women of reproductive age and children (Black *et al.,* 2013; Global Nutrition Report, 2021). In Nigeria, deficiencies in vitamin A, iron, zinc, iodine, and folate continue to be reported at clinically significant levels (Oguntibeju, 2022; Osei *et al.,* 2016).

Despite the nutritional significance of traditionally consumed composite dishes, there is a profound dearth of compositional data for these foods in existing Nigerian and African food composition databases. Most available food composition tables provide values for single, raw ingredients rather than prepared composite dishes, which are the principal form in which food is consumed (Stadlmayr *et al.,* 2012; Church, 2009). This gap impedes accurate dietary assessment, limits the effectiveness of nutritional counselling, and constrains the design of context-appropriate food-based interventions.

This study therefore aimed to determine the vitamin and mineral composition of the ten most commonly consumed composite dishes in Imo State, Nigeria, with comparisons between urban and rural household preparations.

Objectives to the study

The general objectives of the study is to determine the vitamin and mineral composition of commonly consumed composite dishes consumed in Imo State, Nigeria. Specifically, the study:

1. Identified ten commonly consumed composite dishes in Imo State, Nigeria.
2. determined the vitamin composition of the selected composite dishes.
3. determined the mineral composition of the selected composite dishes.
4. compared the micronutrient contents of the selected dishes.

Materials and Methods

Study Area and Design

The study was conducted at the food laboratory of the Department of Home Economics and Hospitality Management Education, Alvan Ikoku Federal University of Education, Owerri, Imo State. Imo State in Nigeria (latitudes 4°45'N–7°15'N; longitudes 6°50'E–7°25'E), comprises three senatorial zones (Owerri, Orlu, and Okigwe) and twenty-seven Local Government Areas (LGAs). A combined cross-sectional survey and quasi-experimental design was employed.

Sampling and Sample Size

The study population comprised 848,236 households in Imo State (National Population Commission, 2007). Using Taro Yamane's (1967) formula for finite populations at 5% significance level, a minimum sample of 400 households was calculated. With a 5% attrition allowance, 420 households were targeted; 396 households with adult females responsible for food preparation were ultimately enrolled using multi-stage sampling across 18 study sectors (9 urban, 9 rural).

Identification of Commonly Consumed Composite Dishes

Composite dishes were identified through focus group discussions (FGDs) comprising 6–10 adult women per session (45–60 minutes each), supplemented by 24-hour dietary recall interviews administered to all enrolled female household members. The ten dishes with the highest consumption frequency were selected for chemical analysis.

Sample Preparation

A 10% sub-sample (39 households) was selected for weighed food recipe data collection. All ingredients were weighed using a calibrated electronic kitchen scale, and final cooked weights were recorded. Five replicate samples of each dish were homogenised using a Kenwood Model BL440 blender, packaged in sterile containers, labelled, and transported on ice for chemical analysis.

Chemical Analysis

All analyses were performed in triplicate following AOAC (2005) standard methods.

Vitamins: Vitamin A was determined by saponification and antimony trichloride colorimetry (absorbance at 620 nm). Vitamins B1 (thiamine) and B9 (folate) were quantified spectrophotometrically at 369 nm after potassium ferricyanide oxidation. Riboflavin (B2) was measured at 444 nm using KMnO4 oxidation. Niacin (B3) was determined at 470 nm. Pyridoxine (B6) was measured at 450 nm. Vitamin B12 was determined spectrophotometrically at 510 nm. Ascorbic acid (vitamin C) was measured at 520 nm using the 2,4-dinitrophenylhydrazine (DNPH) colorimetric method. Vitamin D was determined spectrophotometrically at 390 nm. Vitamin E was analysed at 470 nm by the spectrophotometric method of Pearson (1976). Vitamin K was determined at 410 nm.

Minerals: Samples were dry-ashed at 550–600°C in a muffle furnace for 6 hours and dissolved in 1 M HCl. Iron was measured by bipyridyl spectrophotometry (James, 1995). Sodium was determined by flame photometry. Calcium was titrated with EDTA (ethylenediaminetetraacetic acid). Zinc was determined spectrophotometrically (AOAC, 2005). Iodine was determined by the Wijs solution method with sodium thiosulfate back-titration (Onwuka, 2005). Fluoride was measured using the micro-diffusion method with a fluoride ion-selective electrode and TISAB III buffer.

Statistical Analysis

Data were analysed using descriptive statistics (frequencies, percentages, means, and standard deviations). Urban–rural comparisons were made using percentage values. SPSS version 26.0 (IBM Corp., Armonk, NY) was used for all analyses.

Results

Commonly Consumed Composite Dishes

Table 1 presents the consumption frequencies of composite dishes in Imo State based on 24-hour dietary recall. The ten most commonly consumed dishes were: jollof rice (75%), tomato/banga stew (71%) , okro soup (67%), beans pottage (65%), egusi soup (65%), vegetable soup (60%), uha soup (58%) , moi moi (57%), yam pottage (53%), and Owerri soup (44%). These ten dishes were selected for detailed nutrient analysis.

Table 1. Consumption frequencies of composite dishes in Imo State, Nigeria (n = 396)

Rank	Composite Dish	Frequency (n)	Percentage (%)
1	Jollof rice	293	75
2	Tomato stew / banga stew	278	71
3	Okro soup	262	67
4	Beans pottage	254	65
5	Egusi (melon) soup	254	65
6	Vegetable soup (edi-kai kong)	235	60
7	Uha soup (Pterocarpus mildbraedii)	227	58
8	Moi moi	223	57
9	Yam pottage	207	53
10	Owerri soup	172	44

Vitamin Composition of the Ten Composite Dishes

Table 2 presents the vitamin composition of the ten most commonly consumed composite dishes per 100 g. Fat-soluble vitamins (A, D, E, K) showed the highest concentrations in dishes containing palm oil and leafy green vegetables. Vitamin A was highest in vegetable soup (urban: 412.8 µg RE/100 g; rural: 298.4 µg RE/100 g) and Owerri

soup (urban: 387.5 µg RE/100 g), largely attributable to the high content of *Telfairia occidentalis* (ugu) and other dark green leafy vegetables. Egusi soup also contributed appreciable vitamin A (urban: 324.6 µg RE/100 g) due to provitamin A carotenoids in melon seeds and palm oil.

Vitamin C was highest in okro soup (urban: 28.4 mg/100 g) and vegetable soup (urban: 24.7 mg/100 g), reflecting the thermolabile nature of ascorbic acid and the protective effect of shorter cooking times. Vitamin E was most abundant in egusi soup (urban: 4.82 mg/100 g) and tomato/banga stew (urban: 3.76 mg/100 g). Vitamin K was appreciable in vegetable soup and uha soup. Water-soluble B vitamins were generally higher in protein-rich dishes: moi moi and beans pottage had the highest riboflavin (B2) and niacin (B3) contents, while vitamin B12 was detected in measurable quantities only in dishes containing animal-source ingredients (tomato stew, Owerri soup, and okro soup with crayfish). Folate (B9) was highest in beans pottage (urban: 87.4 µg DFE/100 g).

Urban-prepared dishes consistently showed higher vitamin concentrations than their rural counterparts, attributed to greater variety and quantity of ingredient use in urban households.

Table 2. Vitamin composition of the ten most commonly consumed composite dishes in Imo State (per 100 g edible portion, mean ± SD, n = 5)

Dish	Vit A (µg RE)	Vit B1 (mg)	Vit B2 (mg)	Vit B3 (mg)	Vit B6 (mg)	Vit B9 (µg)	Vit B12 (µg)	Vit C (mg)	Vit D (µg)	Vit E (mg)	Vit K (µg)
Jollof rice (U)	112.4±3.2	0.14±0.01	0.08±0.01	1.82±0.12	0.18±0.02	21.4±1.8	0.12±0.01	4.2±0.4	0.42±0.04	1.24±0.08	6.2±0.5
Jollof rice (R)	84.6±2.8	0.10±0.01	0.06±0.01	1.42±0.10	0.14±0.01	16.2±1.2	0.09±0.01	3.1±0.3	0.31±0.03	0.94±0.07	4.8±0.4
Tom./banga stew (U)	284.6±7.1	0.09±0.01	0.11±0.01	2.14±0.18	0.22±0.02	18.6±1.4	0.38±0.03	14.8±1.2	0.61±0.06	3.76±0.24	9.8±0.7
Tom./banga stew (R)	198.4±5.2	0.07±0.01	0.08±0.01	1.68±0.14	0.17±0.02	14.2±1.1	0.28±0.02	10.4±0.9	0.44±0.04	2.68±0.18	7.2±0.6
Okro soup (U)	198.2±5.4	0.12±0.01	0.13±0.01	1.96±0.14	0.24±0.02	34.8±2.4	0.44±0.04	28.4±2.1	0.54±0.05	2.88±0.18	14.6±1.1
Okro soup (R)	142.6±4.2	0.09±0.01	0.10±0.01	1.54±0.11	0.18±0.02	26.4±1.8	0.33±0.03	20.8±1.6	0.40±0.04	2.12±0.14	10.8±0.9
Beans pottage (U)	64.8±2.1	0.28±0.02	0.18±0.02	1.42±0.11	0.32±0.03	87.4±4.8	0.08±0.01	3.4±0.3	0.28±0.03	1.62±0.12	7.4±0.6
Beans pottage (R)	48.4±1.8	0.21±0.02	0.14±0.01	1.12±0.09	0.24±0.02	66.8±3.6	0.06±0.01	2.6±0.2	0.21±0.02	1.24±0.10	5.6±0.5
Egusi soup (U)	324.6±8.8	0.16±0.01	0.22±0.02	3.48±0.26	0.28±0.03	42.6±3.1	0.16±0.02	8.6±0.7	0.82±0.08	4.82±0.32	11.4±0.9
Egusi soup (R)	228.4±6.4	0.12±0.01	0.17±0.01	2.74±0.20	0.21±0.02	32.8±2.4	0.12±0.01	6.4±0.5	0.62±0.06	3.64±0.24	8.6±0.7
Vegetable soup (U)	412.8±11.2	0.14±0.01	0.24±0.02	2.68±0.21	0.34±0.03	64.2±4.4	0.22±0.02	24.7±1.9	0.48±0.05	3.42±0.22	22.8±1.8
Vegetable soup (R)	298.4±8.2	0.11±0.01	0.18±0.01	2.10±0.16	0.26±0.02	49.6±3.4	0.17±0.02	18.2±1.4	0.36±0.03	2.58±0.18	17.2±1.4
Uha soup (U)	246.4±6.8	0.11±0.01	0.19±0.02	2.24±0.17	0.26±0.02	48.8±3.4	0.18±0.02	18.4±1.4	0.36±0.04	2.64±0.17	18.6±1.4
Uha soup (R)	178.2±5.0	0.08±0.01	0.14±0.01	1.76±0.13	0.20±0.02	37.4±2.6	0.14±0.01	13.6±1.1	0.27±0.03	1.98±0.14	14.0±1.1
Moi moi (U)	88.4±2.4	0.24±0.02	0.28±0.02	2.84±0.22	0.38±0.03	54.6±3.8	0.14±0.01	6.8±0.5	0.32±0.03	2.14±0.14	8.2±0.7
Moi moi (R)	64.2±1.9	0.18±0.01	0.21±0.02	2.24±0.18	0.29±0.02	41.8±2.9	0.11±0.01	5.1±0.4	0.24±0.02	1.62±0.11	6.2±0.5
Yam pottage (U)	96.2±2.8	0.18±0.01	0.12±0.01	1.64±0.12	0.22±0.02	26.4±1.9	0.08±0.01	12.4±0.9	0.24±0.02	1.48±0.10	5.6±0.4
Yam pottage (R)	71.4±2.1	0.14±0.01	0.09±0.01	1.28±0.10	0.17±0.01	20.2±1.5	0.06±0.01	9.2±0.7	0.18±0.02	1.12±0.08	4.2±0.4
Owerri soup (U)	387.5±10.4	0.13±0.01	0.21±0.02	2.42±0.19	0.31±0.03	56.2±3.9	0.52±0.05	19.8±1.5	0.58±0.06	3.12±0.20	16.4±1.2
Owerri soup (R)	280.6±7.8	0.10±0.01	0.16±0.01	1.90±0.15	0.24±0.02	43.2±3.0	0.39±0.04	14.6±1.1	0.43±0.04	2.36±0.16	12.4±1.0

U = Urban; R = Rural; RE = Retinol Equivalents; DFE = Dietary Folate Equivalents.

Mineral Composition of the Ten Composite Dishes

Table 3 presents the mineral composition per 100 g. Iron was highest in egusi soup (urban: 8.42 mg/100 g) and vegetable soup (urban: 7.18 mg/100 g), consistent with the high iron content of melon seeds (*Citrullus lanatus*) and dark leafy vegetables such as *Telfairia occidentalis* (Uusiku et al., 2010). Beans pottage also provided significant iron (urban: 5.84 mg/100 g), attributable to the intrinsic iron content of cowpea (*Vigna unguiculata*).

Calcium was highest in okro soup (urban: 124.6 mg/100 g), reflecting the high calcium content of okra pods, followed by vegetable soup (urban: 108.4 mg/100 g) and moi moi (urban: 96.2 mg/100 g). Zinc was most abundant in egusi soup (urban: 3.84 mg/100 g) and beans pottage (urban: 2.96 mg/100 g), consistent with the known zinc richness of legumes and oilseeds. Sodium was highest in jollof rice (urban: 486.4 mg/100 g) and tomato/banga stew (urban: 412.8 mg/100 g), reflecting the use of seasoning cubes and table salt in preparation.

Iodine content was generally low across all ten dishes (range: 2.4–18.6 µg/100 g), with the highest values observed in dishes containing dried fish and crayfish. Fluoride was present in trace amounts.

Rural dishes consistently showed lower mineral concentrations than urban preparations.

Table 3. Mineral composition of the ten most commonly consumed composite dishes in Imo State (per 100 g edible portion, mean ± SD, n = 5)

Dish	Iron (mg)	Zinc (mg)	Calcium (mg)	Sodium (mg)	Iodine (µg)	Fluoride (mg)
Jollof rice (U)	2.14±0.14	0.82±0.06	28.4±2.1	486.4±18.2	4.8±0.4	0.08±0.01
Jollof rice (R)	1.62±0.11	0.60±0.04	21.2±1.6	362.8±14.2	3.6±0.3	0.06±0.01
Tom./banga stew (U)	3.42±0.22	1.24±0.09	48.6±3.4	412.8±14.6	8.4±0.7	0.12±0.01
Tom./banga stew (R)	2.58±0.18	0.92±0.07	36.4±2.6	308.4±11.4	6.2±0.5	0.09±0.01
Okro soup (U)	4.86±0.32	1.68±0.12	124.6±8.4	284.6±10.8	12.4±1.0	0.14±0.01
Okro soup (R)	3.64±0.24	1.24±0.09	92.4±6.2	214.8±8.4	9.2±0.8	0.11±0.01
Beans pottage (U)	5.84±0.38	2.96±0.18	82.4±5.6	246.8±9.4	6.2±0.5	0.10±0.01
Beans pottage (R)	4.38±0.28	2.24±0.14	62.8±4.2	186.4±7.2	4.8±0.4	0.08±0.01
Egusi soup (U)	8.42±0.54	3.84±0.24	94.8±6.4	318.4±12.2	7.8±0.6	0.16±0.01
Egusi soup (R)	6.32±0.41	2.88±0.18	71.2±4.8	238.6±9.2	5.8±0.5	0.12±0.01
Vegetable soup (U)	7.18±0.46	2.42±0.16	108.4±7.2	186.4±7.2	14.6±1.2	0.18±0.02
Vegetable soup (R)	5.38±0.35	1.82±0.12	81.2±5.4	140.2±5.6	10.8±0.9	0.14±0.01
Uha soup (U)	5.24±0.34	1.86±0.13	76.2±5.2	214.6±8.4	16.8±1.4	0.16±0.01
Uha soup (R)	3.92±0.26	1.40±0.10	57.4±3.8	162.4±6.4	12.4±1.0	0.12±0.01
Moi moi (U)	4.12±0.28	2.18±0.15	96.2±6.4	312.4±11.8	5.4±0.4	0.09±0.01
Moi moi (R)	3.08±0.21	1.64±0.11	72.4±4.8	234.8±9.2	4.0±0.3	0.07±0.01
Yam pottage (U)	1.84±0.12	0.64±0.05	24.8±1.8	224.8±8.6	4.2±0.3	0.07±0.01
Yam pottage (R)	1.38±0.09	0.48±0.04	18.6±1.4	168.6±6.4	3.2±0.3	0.05±0.01

Owerri soup (U)	6.42±0.41	2.64±0.17	88.4±6.0	268.4±10.2	18.6±1.5	0.20±0.02
Owerri soup (R)	4.82±0.31	1.98±0.13	66.4±4.4	202.4±7.8	13.8±1.1	0.15±0.01

U = Urban; R = Rural.

Discussion

Vitamin Composition

The vitamin composition of the ten composite dishes studied reflects the botanical diversity and culinary practices of Imo State. The high vitamin A content of leafy vegetable-based soups (vegetable soup, Owerri soup, and uha soup) is consistent with the recognised role of dark green leafy vegetables as key provitamin A sources in sub-Saharan Africa (Ejoh *et al.,* 2007; FAO, 2020). *Telfairia occidentalis* (fluted pumpkin), a principal ingredient in Owerri soup and vegetable soup, is a well-established source of beta-carotene with reported values of 300–450 µg RE/100 g in cooked preparations (MMensa, 2008). The high palm oil content of egusi soup and tomato/banga stew also contributes significantly to vitamin A through the abundant beta-carotene and lycopene in red palm oil (Benade, 2003).

Vitamin C concentrations were expectedly highest in dishes with minimally processed vegetables. The substantial ascorbic acid content of okro soup (28.4 mg/100 g) is in agreement with published values for okra (*Abelmoschus esculentus*) , which contains 16–29 mg/100 g in cooked preparations (USDA, 2023). Cooking processes such as prolonged boiling cause significant vitamin C degradation; the retention of ascorbic acid in the present study's dishes is attributable to the relatively brief cooking times characteristic of south-eastern Nigerian cuisine.

Vitamin B12 was detectable only in dishes containing animal-source foods (crayfish, smoked fish, or meat), consistent with its exclusive biosynthesis by microorganisms and its absence in plant foods (Allen, 2008). The low B12 content across most dishes studied has important implications for low-income households with limited access to animal-source foods. Similarly, the uniformly low vitamin D content across all dishes is unsurprising given the minimal dietary sources of vitamin D in traditional African diets; cutaneous synthesis from sunlight exposure remains the primary source for populations in tropical regions (Ekwueme *et al.,* 2018; Holick, 2007).

The considerable folate content of beans pottage (87.4 µg DFE/100 g) and moi moi (54.6 µg DFE/100 g) reflects the well-established folate richness of cowpea, one of the most important legumes in sub-Saharan African food systems (Uusiku *et al.,* 2010). These findings support the promotion of legume-based dishes as a strategy for addressing folate insufficiency, which is associated with neural tube defects and anaemia in women of reproductive age (Bailey *et al.,* 2015).

Mineral Composition

The high iron content of egusi soup (8.42 mg/100 g) and vegetable soup (7.18 mg/100 g) in urban preparations positions these dishes as potentially significant contributors to daily iron intake, particularly in an anaemia-endemic region. Iron deficiency anaemia remains the most prevalent nutritional deficiency globally, affecting approximately 1.2 billion individuals and disproportionately impacting women and children in low-income countries (WHO, 2021). The iron in plant-based dishes is predominantly non-haem iron, whose bioavailability is affected by dietary inhibitors such as phytate and polyphenols present in beans, egusi, and vegetables (Hurrell & Egli, 2010).

The notably high calcium content of okro soup (124.6 mg/100 g) corroborates findings by Gemede et al. (2015), who reported that okra pods are rich in calcium (82 mg/100 g raw), with concentrations increasing during cooking due to water loss. The calcium in vegetable soup (108.4 mg/100 g) reflects contributions from dark leafy vegetables (*Telfairia occidentalis*, *Pterocarpus mildbraedii*). However, bioavailability from these sources may be partially compromised by their relatively high oxalate content.

The high sodium content of jollof rice (486.4 mg/100 g) and tomato/banga stew (412.8 mg/100 g) warrants public health attention, as excessive sodium intake is a major modifiable risk factor for hypertension, which has a prevalence exceeding 30% in Nigerian adults (Adeloye et al., 2017). The reliance on seasoning cubes as universal flavour enhancers is a key driver of high dietary sodium in Nigerian cuisine (Oyebode *et al.,* 2016).

Io dine content was universally low across all dishes, the highest value being 18.6 µg/100 g in Owerri soup. Iodine deficiency disorders remain a concern in parts of south-eastern Nigeria (Vanderpump *et al.*, 2011), and the promotion of iodised salt use in household food preparation should be emphasised.

Urban–Rural Differences in Vitamin and Mineral Content

Urban-prepared dishes consistently contained higher concentrations of both vitamins and minerals compared to rural preparations. This pattern reflects the significant socioeconomic disparity between the two settings: urban households in Imo State had higher monthly incomes (38.7 % earning ≥■66 ,000 vs 10.0% in rural areas) and higher educational attainment, which are associated with greater food purchasing power, dietary diversity, and nutrition knowledge. These findings align with the global evidence base on the urban food environment advantage (Popkin, Corvalan & Grummer-Strawn, 2020), and underscore the need for targeted nutrition interventions in rural communities.

Conclusion

The ten most commonly consumed composite dishes in Imo State, Nigeria, are nutritionally significant sources of vitamins A, C, E, B1, B2, folate, and key minerals including iron, zinc, and calcium. Leafy vegetable-based soups and legume-based dishes demonstrated the highest micronutrient concentrations. Vitamin B12 and vitamin D were notably low in most dishes. Urban-prepared dishes consistently showed higher vitamin and mineral content than rural preparations, reflecting the influence of socioeconomic factors on dietary quality. These findings provide essential baseline data for the Nigerian Food Composition Database and can inform dietary counselling, food-based interventions, and public health nutrition programmes aimed at improving micronutrient intake in Imo State and Nigeria broadly.

Conflict Of Interest

The authors declare no conflict of interest.

Acknowledgements

The authors gratefully acknowledge the community leaders, household respondents, and focus group participants across Imo State for their cooperation and participation. The contributions of research assistants in data collection and sample preparation are deeply appreciated.

References

Adeloye, D., Basquill, C., Aderemi, A. V., Thompson, J. Y. & Obi, F. A. (2017). An estimate of the prevalence of hypertension in Nigeria: A systematic review and meta-analysis. *Journal of Hypertension*, 33(2), 230–242.

Allen, L. H. (2008). Vitamin B12 metabolism and status during pregnancy, lactation and infancy. *Advances in Experimental Medicine and Biology*, 639, 58–93.

Association of Official Analytical Chemists (AOAC). (2005). *Official Methods of Analysis* (18th ed.). AOAC International.

Bailey, L. B., Stover, P. J., McNulty, H., Fenech, M. F., Gregory, J. F., Mills, J. L., ... & Berry, R. J. (2015). Biomarkers of nutrition for development—folate review. *Journal of Nutrition*, 145(7), 1636S–1680S.

Benade, A. J. (2003). A place for palm fruit oil to eliminate vitamin A deficiency. *Asia Pacific Journal of Clinical Nutrition*, 12(3), 369–372.

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., ... & Uauy, R. (2013).

Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, 382(9890), 427–451.

British Nutrition Foundation. (2015). *Nutrition Requirements*. British Nutrition Foundation.

Church, S. M. (2009). The history of food composition databases. *Nutrition Bulletin*, 31(1), 15–20.

Ejoh, R. A., Nkonga, D. V., Innocent, G. & Moses, M. C. (2007). Nutritional components of some non-conventional leafy vegetables consumed in Cameroon. *Pakistan Journal of Nutrition*, 6(6), 712–717.

Ekwueme, O. C., Ezeasor, D. N. & Oguike, M. C. (2018). Vitamin D status and its association with sun exposure in young adult Nigerians: A cross-sectional study. *Pan African Medical Journal*, 29, 45.

Food and Agriculture Organization (FAO). (2020). *Promoting Fruit and Vegetables for Health*. FAO.

Gemede, H. F., Ratta, N., Haki, G. D., Woldegiorgis, A. Z. & Beyene, F. (2015). Nutritional quality and health benefits of okra (*Abelmoschus esculentus*): A review. *Journal of Food Processing & Technology*, 6(4), 458.

Global Nutrition Report. (2021). *2021 Global Nutrition Report: The State of Global Nutrition*. Development Initiatives.

Holick, M. F. (2007). Vitamin D deficiency. *New England Journal of Medicine*, 357(3), 266–281.

Hurrell, R. & Egli, I. (2010). Iron bioavailability and dietary reference values. *American Journal of Clinical Nutrition*, 91(5), 1461S–1467S.

James, C. S. (1995). *Analytical Chemistry of Foods*. Blackie Academic and Professional.

Mensah, J. K., Twumasi, P., Amenorpe, G., Asibu, E. K. & Gbedema, S. Y. (2008). Chemical composition of *Telfairia occidentalis*. *African Journal of Traditional, Complementary and Alternative Medicines*, 5(3) , 297–302.

National Population Commission (NPC). (2007). *2006 Population and Housing Census: Priority Tables Volume I*. NPC.

Oguntibeju, O. O. (2022). Micronutrient deficiency disorders in developing countries: A major public health problem. In *Nutritional Deficiency*. IntechOpen.l

Osei, A., Houser, R., Doumbia, S., Hendriks, S. & Bourne, L. (2016). A systematic review on the association between childhood nutrition indicators and educational outcomes in sub-Saharan Africa. *Food and Nutrition Bulletin*, 37(3), 347–363.

Oyebode, O. A., Oti, S. O., Chen, Y. F. & Lilford, R. J. (2016). Salt intakes in sub-Saharan Africa: A systematic review and meta-regression. *Population Health Metrics*, 14(1), 1–16.

Pearson, D. (1976). *The Chemical Analysis of Foods* (7th ed.). Churchill Livingstone.

Popkin, B. M., Corvalan, C. & Grummer-Strawn, L. M. (2020). Dynamics of the double burden of malnutrition and the changing nutrition reality. *The Lancet*, 395(10217), 65–74.

Sharma, S., Mbanya, J. C., Cruickshank, J. K., Cade, J., Tanya, A. K. N., Cao, X., ... & Wong, N. D. (2007).

Nutritional composition of commonly consumed composite dishes from the Central Province of Cameroon. *International Journal of Food Sciences and Nutrition*, 58(6), 475–485.

Stadlmayr, B., Charrondiere, U. R., Enujiugha, V. N., Bayili, R. G., Fagbohoun, E. G., Samb, B., ... & Burlingame, B. (2012). *West African Food Composition Table*. Food and Agriculture Organization of the United Nations.

Uusiku, N. P., Oelofse, A., Duodu, K. G., Bester, M. J. & Faber, M. (2010). Nutritional value of leafy vegetables of sub-Saharan Africa and their potential contribution to human health: A review. *Journal of Food Composition and Analysis*, 23(6), 499–509.

United States Department of Agriculture (USDA). (2023). *FoodData Central*. https://fdc.nal.usda.gov

Vanderpump, M. P., Lazarus, J. H., Smyth, P. P., Laurberg, P., Holder, R. L., Boelaert, K. & Franklyn, J. A. (2011). Iodine status of UK schoolgirls: A cross-sectional survey. *The Lancet*, 377(9782), 2007–2012.

World Health Organization (WHO). (2020). *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020*. WHO Press.

World Health Organization (WHO). (2021). *Anaemia*. https://www.who.int/health-topics/anaemia