Standardization and Proximate Contents of Selected Commonly Consumed Nigerian Soups and Dishes

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ABSTRACT

***Background**: The change in the dietary pattern of Nigerians to a more western diet has been implicated in adverse health outcomes increassing in the prevalence of undernutrition and chronic diseases. Availability of recent data on recipe and nutrient content of foods as consumed is crucial in disease management and dietary intake studies.*

***Objective**: This study standardized and determined proximate contents of selected commonly consumed Nigerian soups and dishes.*

***Materials and methods**: A cross-sectional and convergent parallel design was adopted. Recipe of soups and dishes of households were obtained from 800 purposively selected housewives in Lagos, Ogun, Oyo and Osun States, Nigeria using semi-structured questionnaire and 4 focus-group discussion sessions. Recipes were standardized, soup and dish samples were prepared and analyzed for proximate contents using standard methods of AOAC. Data were analyzed using median, mean and standard deviation using Microsoft excel office 2019 software.*

***Results**: Moisture content of the soups and dishes ranged from 40.54–85.49 g/100g, carbohydrate content ranged from 0.74–32.53 g/100g, protein content ranged from 4.49–26.85 g/100g, fat content ranged from 6.03–21.81 g/100g, crude fibre content ranged from 0.24–2.38 g/100g and ash content ranged from 0.24–3.00 g/100g.*

***Conclusion:**Soups had higher protein, fat and crude fibre contents while dishes had higher carbohydrate contents.Habitual consumption of most of these soups and dishes may promote healthy dietary lifestyle and reduce diet-related disease risk.*

Keywords: Nutrients, Soups, Dishes, Standardization, Nigeria

INTRODUCTION

Nigeria is a society having many cultures and has experienced change in her food consumption pattern [1]. A typical Nigerian diet is comprised of carbohydrate-based meal (cassava flour, rice, cocoyam, potatoes, yam or plantain) consumed with soup or stew cooked with palm oil, pepper, vegetable and little protein source [2]. In Nigeria, a soup is cooked with combination of ingredients from both plants and animal source such as meat, fish, palm oil, vegetables, crayfish, seasonings and water [3, 4] which are good sources of nutrients, particularly micronutrients required for healthy living.However, the emergence of nutrition transition vis-a-vis globalization combined with industrialization, urbanization and economic developments experienced in many developing countries has created changes in ingredients and methods by which soups and dishes are cooked in Nigeria. As a result, most Nigerian soups and dishes now have a blend of western ingredients and methods in their preparations [5, 6, 7]. This changehas significant

impact on the health and nutritional status of many Nigerian populations [5, 7], increasing the occurrence of nutrition-related degenerative chronic diseases of lifestyle, such as hypertension, obesity, diabetes mellitus and dyslipidaemia [8, 9] in addition to the existing problem of undernutrition.

Although, efforts have been made in the past to ensure availability of data on standardize soups and dishes consumed in Nigeria. However, many of these data [10, 11, 12, 13] were not recent and information on nutrient contents of standardized soups and dishes commonly consumed in Nigeria [6, 14, 15, 16, 17, 18, 19, 20, 21], were based on these non-current standardized methods above. Also, some authors have published nutrient information on raw and pre-treated ingredients used for the preparation of soups and dishes [22, 23], however recent recipe on these soups and dishes as consumed are scarce and the recently launched Nigerian Food Composition table in 2017 [24] does not capture all the foods consumed in Nigeria compared to Nigerian diversity.

Standardization of recipes and methods of preparation of soups and dishes commonly consumed in Nigeria will provide baseline information on the appropriate recipe in terms of ingredients' quantity and quality, as well as methods of preparation of soups and dishes in recent times in Nigeria. Provision of original data on nutrients contents of soups and dishes will enrich the food composition table in Nigeria and provide useful information which will assist nutritionists and dietitians in accurate assessment of nutritional status of Nigerians, diet planning and counselling for different population group, particularly in the management of health and disease conditions and promote accurate food labelling. This information will also help to promote good health and reduce the occurrences of chronic diseases and micronutrient deficiency diseases that may arise from inappropriate consumption of Nigerian soups and dishes. This study therefore standardized and determined the proximate contents of selected Nigerian soups and dishes

Materials and methods

Research design

This study adopted a cross-sectional and convergent parallel mixed research design.

Recipe collection

A semi-structured, interviewer-administered questionnaire was used to obtain information on recipe of selected commonly consumed soups and dishes, not captured in Nigerian food composition table and previous studies, from 800 housewives. Four focus-group sessions were also simultaneously conducted between 6-10 housewives. Respondents were housewives living in major cities of Lagos, Ogun, Oyo and Osun states in South-West Nigeria who were willing and usually cook the soups. Information was collected on the ingredients, ingredients' quantity (using household measures and food samples and models), quality, methods of preparation, cooking time and technique.

Recipe Collation and Standardization

The median values of the recipe of each soup was calculated to obtain the standardized recipe. The ingredients used by majority of the respondents from the focus group sessions were compared and related with that of the quantitative data and collated. The median ingredient quantity used by majority of the respondents was also compared and related with that of the focus group discussions and calculated, average cooking time was determined quantitatively, cooking temperature was described as low, medium and moderate heat as none of the respondents used thermometer to measure temperature during cooking. The common method of preparation, quality of ingredients and cooking technique as reported by the respondents were determined and used to prepare the soups and dishes. Soups and dishes were categorized based on geographical zone of predominant consumption.

Ingredient Purchase, Sample Preparation and Treatment

Ingredients used for the preparation of the soups were purchased from popular markets in Lagos, Oyo, Osun and Ogun States Southwest, Nigeria. The soups and dishes were prepared at the Food Preparation Laboratory of the Department of Nutrition and Dietetics, Federal University of Agriculture Abeokuta, using the standardized recipe. Description of ingredients of the standardized recipe is shown below. After preparation, the soups were cooled, and approximately 200 g each of each soup was separately homogenized. Aliquot was used to determine moisture content of the soups. Samples were dried in an oven at 105°C for 12

hours and packed separately in plastic bottles, labelled, dated and then kept frozen for further analysis.

Standardized recipe of the commonly consumed Nigerian soups and dishes based on geopolitical region of predominant consumption

a. General

1. **Boiled rice and fish stew:** Polished rice (*oryzasativa*) (2800g), white, boiled with water (1035ml), salt (30g), vegetable oil (30ml) for 25 minutes and served with fish stew cooked with onions (300g), tomatoes (1100mg), hot pepper (*Capsicum Chinense*) (200g), chilli pepper (*Capsicum frutescens*) (100g), bell pepper (*Capsicum anuum*) (200g), tomato paste (70g), water (100ml) mackerel frozen fish (500g), vegetable oil (250ml), salt (15g), curry (2g), thyme (2g) and bouillon cube (8g) for 30 minutes

2. Bread and beans: Cowpea (*Vigna unguiculata*), whole (560g), boiled with water (3000ml), blended hot pepper (*Capsicum Chinense*) (40g), shredded onions (120g), palm oil (150ml), salt (20g) for 45 minutes and served with bread (400g) made from refined wheat flour.

3. Beans and corn: Cowpea (*Vigna unguiculata*), whole (560g), boiled with corn (225g) in water (3400ml) and added blended hot pepper (*Capsicum Chinense*) (60g), shredded onions (120g), palm oil (180ml), salt (25g) and bouillon cube (8g) for 50 minutes.

4. Beef soup: Fresh beef (1000g) boiled and cooked with blended tomatoes (1220g), hot pepper (*Capsicum Chinense*) (200g), bell pepper (*Capsicum anuum*) (80g), onions (120g), vegetable oil (188ml), salt (5g) and bouillon cubes (12g) for 20 minutes.

5. Chicken stew: Fresh chicken (1000g) boiled and cooked with blended tomatoes (1220g), hot pepper (*Capsicum Chinense*) (200g), bell pepper (*Capsicum anuum*) (80g), onions (120g), vegetable oil (188ml), salt (5g) and bouillon cubes (12g) for 20 minutes.

6. Fish stew: Fresh fish (800g) boiled and cooked with blended tomatoes (1220g), hot pepper (*Capsicum Chinense*) (200g), bell pepper (*Capsicum anuum*) (80g), onions (120g), vegetable oil (188ml), salt (5g) and bouillon cubes (12g) for 20 minutes.

b. South Western

7. Boiled yam and garden egg sauce: Yam (*Dioscorea alata)*, white fresh, peeled (2040g), boiled in water (1000ml) with salt (10g) for 20 minutes and served with mashed boiled garden egg (450g) sauce cooked with diced hot pepper (*Capsicum Chinense*) (80g), tomatoes (350g), onions (150g), locust beans (15g), smoked mackerel fish (300g), palm oil (180ml), water (100ml), salt (15g) and bouillon cube (8g) cooked for 25 minutes.

8. Ofada rice and fish stew: Unpolished rice (*Oryza glaberrima*), fresh (720g), boiled with water (3000ml) and salt (10g) for 25 minutes and served with stew cooked with roughly blended hot pepper (*Capsicum Chinense*) (150g), bell pepper (*Capsicum anuum*) (80g) onions (275g), locust beans (25g), boiled offals (200g), diced cow's skin (120g), smoked mackerel fish (325g), salt (10g), palm oil (250ml) and bouillon cube for 20 minutes.

9. Akara and agidi: Cowpea (*Vigna unguiculata*) (300g), soaked, dehulled, blended to paste with added blended hot pepper (*Capsicum Chinense*) (30g) with onions (50g), salt (3g), bouillon cube (4g) and fried with vegetable oil (150ml) for 7 minutes and served with agidi made from cooked maize gruel (fermented)

10. Ila alasepo: Fresh okra (*abelmuscus esculentum* Lin.) Moench (250g) grated and cooked with blended hot pepper (*Capsicum Chinense*) (80g), locust beans (30g), bouillon cubes (4g), salt (2.5g) smoked panla fish (250g), water (1500ml) and palm oil (82ml) for 7 minutes.

11. Gbegiri soup: Deskinned beans (300g), cooked with blended hot pepper (60g), smoked mackerel fish (60g), stock fish (60g), dried crayfish (10g), locust beans (15g), salt (4g), bouillon cube (8g) and palm oil (100ml) for 15 minutes.

12. Egusi soup: Melon seeds (*Citrullu vulgaris* Thnb.) grinded into paste (100g), cooked with palm oil (200ml), locust beans (20g), diced onions (40g), blended hot pepper (60g), smoked mackerel fish (120g), smoked cow's skin (40g), diced crayfish (10g), diced ugwu leaves (Telferia occidentalis) (170g) and salt (4g) for 15 minutes.

c. South South

13. Banga soup: Palm kernel (700g), boiled, dehulled, sieved with water and cooked with blended hot pepper (*Capsicum Chinense*) (60g), beef 600g), smoked catfish (200g), stock fish (70g), crayfish (20g), onions (15g), salt (5g), scent leaves (30g) and bouillon cubes (12g) for 15 minutes.

14. Afang soup : Okazi leaves (82g), ugwu leaves (*Telferia occidentalis*) (80g), water leaf

(40g), blended Cameroon pepper (15g), stock fish (70g), crayfish (60g), palm oil (350ml), cow's skin (160g), beef (450g) boiled, boiled periwinkle (80g), onions (40g) and ogiri (15g) for 20 minutes.

South East

15. Ogbono soup: Blended ogbono seeds (60g), cooked with ugwu (*Telferia* occidentalis) leaves (22.5g), blended chilli pepper (15g), stock fish (70g), crayfish (60g), palm oil (100ml), ogiri (15g), beef (450g), bouillon cube (12g) for 10 minutes.

16. Oha soup: Oha leaves (60g), cooked with cocoyam (400g) boiled, squeezed and dried bitter leaf (15g), blended dried chilli pepper (15g), onions (50g), stock fish (70g), dried crayfish (60g), dried mackerel fish (80g), palm oil (200ml), beef (600g) boiled, bouillon cubes (12g) for 20 minutes.

17. Okazi soup: Okazi leaves (*Gnetum Africanum*) (600g), shredded, cooked with blended chilli pepper (*Capsicum frutescens*) (15g), achi (40g), crayfish (60g), boiled beef (600g), stock fish (70g), dried fish (300g), onions (30g), palm oil (200ml), water (600ml), salt (8g) and bouillon cube (12g) for 20 minutes.

d. Northern (North Central, North East, North West)

18. Miyan kuka: Dried kuka leaves (baoba leaves) powder (30g), cooked with blended hot pepper (*Capsicum Chinense*) (50g), onions (20g), blended chilli pepper (*Capsicum frutescens*) (5g), crayfish (100g), smoked mackerel fish (125g), beef (150g), palm oil (50ml), water (1000ml) dawadawa (12.5g), salt (5g) for 10 minutes.

19. Groundnut soup: Fresh groundnut (*Arachis hypogea*) roasted, dehulled, blended into paste (300g) and cooked with blended hot pepper (*Capsicum Chinense*) (95g) with onions (40g), beef (200g), boiled, dried crayfish (10g), smoked mackerel fish (100g), palm oil (80ml), dawadawa (10g), bouillon cubes (8g), salt (5g), bouillon cube (750ml) for 20 minutes.

20. Miyan taushe: Diced kabewa (840g), cooked with boiled beef (150g), onions (20g), groundnut paste (150g), blended hot pepper (60g), smoked mackerel fish (40g), dried crayfish (5g), locust beans (15g), palm oil (75ml), yakuwa leaves (5g), amaranthus vegetable (40g), bouillon cube (8g) and salt (5g) for 15 minutes.

Determination of proximate contents of indigenous soups

Soup samples were analyzed for proximate composition using standard methods of the AOAC [25]. Moisture content was done by drying samples to constant weight in an electric oven at 105^{0}C (12 hours). Moisture content was then calculated as per cent water loss. Total nitrogen was determined by the Micro-Kjeldahl method, and crude protein estimated by multiplying the total nitrogen (N) by 6.25, a conversion factor. Total lipids were estimated by petroleum ether extraction, using Tecator Soxhlet apparatus. Total carbohydrate content was determined by difference. The total ash was estimated after incinerating in an ashing muffle furnace for 12 hours at 550^{0}C.

Statistical analysis

Data was analyzed using Microsoft excel office 2019 software. Nutrient data was presented with means and standard deviation

Results:

Proximate content of commonly consumed standardized soups and dishes generally in Nigeria in g/100g

Table 1 shows the proximate contents of selected commonly consumed soups and dishes generally consumed across all the geopolitical regions. The moisture content ranged from 55.28 g/100g (chicken stew) to 79.03 g/100g (fish stew). Total carbohydrate content ranged from 1.01 g/100g (beef stew) to 15.65 g/100g) (boiled rice and fish stew). Total protein content ranged from 7.50 g/100g (boiled rice and fish stew) 26.85 g/100g (chicken stew), total fat content ranged from 6.58 g/100g (beans and corn) to 10.10 g/100g (chicken stew), total crude fibre content ranged from 0.24 g/100g (beef stew) to 2.38 g/100g (bread and beans) and total ash content ranged from 0.81 g/100g (fish stew) to 2.17 g/100g (chicken stew).

Proximate contents of commonly consumed standardized soups and dishes in Western Nigeria in g/100g

Table 2 shows the proximate contents of commonly consumed soups and dishes in Western Nigeria. The moisture contents ranged from 40.54 g/100g (akara and agidi) to 75.67 g/100g (gbegiri soup), carbohydrate content ranged from 1.95 g/100g (egusi soup) to 32.53 g/100g (akara and agidi), protein content ranged from 4.49 g/100g (boiled yam and garden egg sauce) to 11.83 g/100g (akara and agidi), fat content ranged from 7.56 g/100g (gbegiri soup)

Table 1: Proximate content of commonly consumed standardized soups and dishes generally in Nigerian regionsin g/100g

		Moisture (g)	Carbohydrate (g)	Protein (g)	Fat (g)	Crude Fiber (g)	Ash (g)
1	Boiled rice and fish stew	68.54±0.13	15.65±0.04	7.50±0.01	7.45±0.11	1.35±0.02	0.86±0.02
2	Bread and beans	65.45±0.84	15.10±0.38	11.19±0.18	7.15±0.21	2.38±0.04	1.11±0.08
3	Beans and corn	67.50±0.24	13.70±0.45	11.33±0.01	6.58±0.20	1.42±0.02	0.89±0.00
4	Chicken stew	55.28±0.16	5.61±0.16	26.85±0.12	10.10±0.19	0.47±0.00	2.17±0.06
5	Beef stew	75.43±0.08	1.01±0.05	12.65±0.06	9.95±0.00	0.24±0.01	0.96±0.02
6	Fish stew	79.03±0.04	0.82±0.05	12.09±0.06	7.25±0.04	0.25±0.01	0.81±0.07

to 15.26 g/100g (egusi soup), crude fibre content ranged from 0.34 g/100g (boiled yam and garden egg sauce) to 1.87 g/100g (ila alasepo) and ash content ranged from 0.67 g/100g (akara and agidi) to 1.23 g/100g (ila alasepo).

Proximate content of commonly consumed standardized soups in South East Nigeria in g/100g

Table 3 shows the proximate content of commonly consumed standardized soups in South East, Nigeria. Moisture content ranged from 56.67 g/100g (okazi soup) to 67.64 g/100g (ogbona soup), carbohydrate content ranged from 0.74 g/100g (ogbona soup) to 6.95 g/100g (oha soup), protein content ranged from 11.14 g/100g (ogbona soup) to 15.89 g/100g (okazi soup), fat content ranged from 18.90 g/100g (oha soup) to 20.77 g/100g (okazi soup), crude fibre content ranged from 0.93 g/100g (ogbona soup) to 1.35 g/100g (oha soup) and ash content ranged from 0.54 g/100g (ogbona soup) to 3.00 g/100g (okazi soup).

Proximate content of commonly consumed standardized soups in South Nigeria in g/100g

Table 3 shows the proximate content of commonly consumed standardized soups in South South, Nigeria. Moisture content ranged from 61.22 g/100g (afang soup) to 76.82 g/100g (banga soup), carbohydrate content ranged from 1.36 g/100g (banga soup) to 13.35 g/100g (afang soup), protein content ranged from 12.75 g/100g (afang soup) to 13.61 g/100g (banga soup), fat content ranged from 7.98 g/100g (banga soup) to 11.78 g/100g (afang soup), crude fibre content ranged from 0.38 g/100g (banga soup) to 0.94 g/100g (afang soup) and ash content ranged from 0.24 g/100g (banga soup) to 0.90 g/100g (afang soup).

Table 2: Proximate content of commonly consumed standardized soups and dishes in South West Nigeria in g/100g

		Moisture (g)	Carbohydrate (g)	Protein (g)	Fat (g)	Crude Fiber (g)	Ash (g)
1	Boiled yam and garden egg sauce	68.30±0.24	16.49±0.03	4.49±0.11	9.95±0.20	0.34±0.01	0.77±0.04
2	Ofada rice and fish stew	68.00±0.23	14.74±0.00	6.89±0.12	9.26±0.12	1.66±0.05	1.11±0.01
3	Akara and agidi	40.54±0.76	32.53±0.04	11.83±0.04	14.43±0.43	0.59±0.06	0.67±0.00
4	Ila alasepo	70.96±0.11	4.44±0.02	11.17±0.07	12.21±0.01	1.87±0.03	1.23±0.02
5	Egusi soup	73.04±0.06	1.95±0.11	8.59±0.02	15.26±0.07	0.79±0.03	1.16±0.03
6	Gbegiri soup	75.67±0.95	7.77±0.21	8.10±0.44	7.56±0.28	0.92±0.11	0.89±0.02

Table 3: Proximate content of commonly consumed standardized soups in South East Nigeria in g/100g

	Moisture (g)	Carbohydrate (g)	Protein (g)	Fat (g)	Crude Fiber (g)	Ash (g)
1 Okazi soup	56.67±0.51	3.67±0.07	15.89±0.10	20.77±0.31	2.19±0.07	3.00±0.06
2 Oha soup	60.71±0.43	6.95±0.10	12.16±0.09	18.90±0.24	1.35±0.03	1.28±0.01
3 Ogbona soup	67.64±0.43	0.74±0.01	11.14±0.06	19.94±0.38	0.93±0.01	0.54±0.00

Table 4: Proximate content of commonly consumed standardized soups in South South Nigeria in g/100g

	Moisture (g)	Carbohydrate (g)	Protein (g)	Fat (g)	Crude Fiber (g)	Ash (g)
1 Banga soup	76.82±0.25	1.36±0.00	13.61±0.11	7.98±0.22	0.38±0.00	0.24±0.01
2 Afang soup	61.22±0.23	13.35±0.01	12.75±0.09	11.78±0.15	0.94±0.00	0.90±0.00

Table 5: Proximate content of commonly consumed standardized soups and dishes in Northern Nigeria in g/100g

	Moisture (g)	Carbohydrate (g)	Protein (g)	Fat (g)	Crude Fiber (g)	Ash (g)
1 Miyan kuka	85.49±0.06	1.06±0.37	7.13±0.06	6.03±0.04	0.29±0.01	0.30±0.01
2 Groundnut soup	56.69±0.54	3.15±0.07	17.20±0.38	21.81±0.36	1.40±0.08	1.15±0.06
3 Miyan Taushe	71.95±0.15	1.75±0.24	11.20±0.18	14.28±0.21	0.58±0.00	0.82±0.01

Proximate content of commonly consumed standardized soups and dishes in Northern (North Central, North West and North East) Nigeria in g/100g

Table 4 shows the proximate contents of commonly consumed standardized soups and dishes in Northern Nigeria. Moisture content ranged from 56.69 g/100g (groundnut soup) to 85.49 g/100g (miyan kuka), carbohydrate, protein, fat and ash and crude fibre contents ranged from 1.06 g/100g, 7.13 g/100g, 6.03 g/100g and 0.30 g/100g, 0.29 g/100g (miyan kuka) respectively to 3.15 g/100g, 17.20 g/100g, 21.81 g/100g and 1.15 g/100g, 1.40 g/100g (groundnut soup) respectively.

Discussion

This study showed that the Nigerian soups and dishes across the geopolitical zones analyzed in this study generally have high moisture content and this may be attributed to the volume of water used in their preparation, as Nigerian soups are known to be watery. 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 [17, 26]. The dishes had higher carbohydrate contents than the soups. This may be attributed to the main ingredients used in the preparation of the dishes (such as rice, beans, corn and yam) which are good sources of carbohydrate. The major source of carbohydrate in the analyzed soups are vegetables and legumes which are composed of complex carbohydrates. In addition, afang soup (a south south soup) had cocoyam (tuber crop) as part of its ingredients and this may explain why its carbohydrate content was high compared to other soups. Carbohydrates play a role in energy metabolism and homoeostasis [25, 26, 27]. They serve as source of energy for all body functions, particularly brain functions and are necessary for the metabolism of other nutrients [27, 28, 30, 31]. Since Nigerian soups which are low in carbohydrate contents are usually consumed with carbohydrate-based meal [2] across the geopolitical zones, the consumption of these Nigerian soups and dishes will promote good health among consumers.

Protein has been identified as a key nutrient because of its role in tissue replacement, immune function, energy balance, bone health, wound healing and cardiovascular functions [32, 33, 34, 35, 36, 37]. In this study, most of the soups, particularly chicken stew, groundnut soup, okazi soup and banga soup had higher protein content compared to soups other dishes. These soups contain chicken, beef, fish and crayfish (which are good sources of animal protein of high biological value) as part of their ingredients. Previous study [3] reported similar finding. Interestingly, groundnut soup which has groundnut as the major ingredient and a plant protein had the second highest protein content. Previous findings [38, 39] have shown that groundnut is a rich source of plant protein and a good protein source for people in low-income settings.

In addition, among the dishes, Akara and agidi, beans and corn, and bread and beans had higher protein content than other dishes. These dishes are composite meals having a combination of cowpea and cereal as major ingredients. Cowpea has been reported to be rich in protein [40]. This combination of different food groups, particularly animal and plant proteins with other food groups in Nigerian diets may be responsible for the high protein content observed in Nigerian soups and dishes. This suggests that habitual consumption of these soups and dishes in adequate portionspromote consumption of complete proteinand reduce the chances of having protein energy malnutrition.

The total fat content was considerably moderate in most soups and dishes. However, groundnut soup (northern soup), okazi, ogbona, oha soups (south east soups) and egusi soup (western soup) had higher total fat contents compared to other soups and dishes. The soups having higher fat content may be attributed to the high amount of oil (palm oil and groundnut oil) combined with animal fat used in theirpreparation. Usually in the southern region of Nigeria, soups are customarily prepared using palm oil and animal fat generously both of which are good sources of saturated fat[6, 41]. In addition, ogbona seed was shown to be high in fat [21] and this may contribute to the high fat content observed in the soups. Although, in Northern region of Nigeria, soups are habitually prepared with little palm oil, groundnut soup (a northern soup) apart from animal fat and palm oil contain groundnut (nut food group) as part of its ingredients, which have been shown to have appreciable amount of saturated fat [42, 43]. Also, Egusi soup in addition to palm oil and animal fat had melon as part of its ingredients which is also a good source of saturated fat.

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 [27, 44], excessiveconsumption of dietary fat has been associated with the risk of obesity, cardiovascular diseases and many non-communicable diseases [8, 9]. This suggests that consumption of most of these soups and dishes in moderate portions may have positive health implication with reference to dietary fat, although excessive consumption may pose adverse health risks. The finding of this study is contrary to those of previous studies where Nigerian soups and dishes were observed to be generous in fat [3, 6]. Most previous findings on fat content of Nigerian foods were not reported as consumed but rather in dry matter without converting it to wet basis as, thus over-reporting the fat contents of the Nigerian foods. Since these Nigerian foods are not consumed in dry matter, these values may not be the correct content of fat and other nutrients in Nigerian foods. Moisture content is determinant of the nutrient concentration of foods. Foods with higher moisture content have lower nutrient concentration. Most food samples are dried prior to further analysis to preserve them from spoilage and therefore the nutrient data from the nutrient analysis should be converted to wet basis as consumed in order to achieve accurate nutrient data that will be useful for dietary intake studies.

This study showed that Nigerian soups and dishes had varied crude fibre contents with bread and beans, okazi soup, ila alasepo, beans and corn, groundnut soup, ofada rice and stew, oha soup and boiled rice and fish stew having higher crude fibre contents respectively compared to soups and dishes. The soups have vegetables (leafy or other vegetables) which are good sources of dietary fibre [21, 45, 46]. Although, groundnut soup did not contain leafy vegetable, however the soup had higher crude fibre compared to miyan kuka which contain leafy vegetable. Also, bread and beans, beans and corn (composite dishes commonly consumed in by all geographical zones), Akara and agidi (composite dish commonly consumed in Western, Nigeria) were observed to have high crude fibre contents compared to other dishes (single dishes). These composite dishes are combination of cereals and legumes. Studies have revealed that legumes, nuts and cereals, particularly whole grain cereals are good sources of dietary fibre [45, 46, 47, 48]. However, the rice-based dishes in this study had

low dietary fibre content. This may be attributed to the processing method used in polished rice production where all the bran is removed. This finding is in consonance with previous finding which reported that rice-based dishes are poor sources of dietary fibre [21, 49, 50]. Rice based dishes - Ofada rice and stew (which contain bran containing high dietary fibre content) and boiled rice and fish stew (whose bran has been removed) have similar crude fibre content in this study. Previous finding revealed that rice-based dishes having bran have higher dietary fibre content when compared to the processed rice [51]. 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.

Fibre in foods have been reported to play a major role in the prevention of chronic diseases: hypertension [52, 53], diabetes [54, 55], cardiovascular disease risk [47, 55, 56], obesity [57, 58], cancer [59, 60] and stroke [61, 62, 63, 64]. 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.

Furthermore, these soups and dishes had low ash contents. Lower ash content has been reported to be an indication of higher nutrient quality, especially minerals [65]. However, okazi soup, chicken stew, ila alasepo, egusi soup, groundnut soup, oha soup, ofada rice and stew and bread and beans had higher ash contents compared to other soups and dishes. This suggests that these soups and dishes having lower ash contents would be good sources of minerals.

Conclusion

This study shows that the dishes contain higher carbohydrates compared to the soups while the soups had higher protein contents. The composite dishes containing a combination of legumes and cereals had higher protein contents than other single dishes. Also, the soups and dishes had moderate fat and the soups and dishes having higher amounts of palm oil, groundnut oil combined with animal fats had higher fat contents. Most of the standardized soups and dishes had appreciable amount of crude fibre however, bread and beans, okazi soup, ila alasepo, beans and corn, groundnut soup, ofada rice and stew, oha soup and boiled rice and fish stew having higher crude fibre contents that other soups and dishes.

Recommendation

It can be recommended thatconsumption of composite meals having a combination of cereals and legumes should be encouraged in order to ensure intake of complete protein and adequate fibre. In addition, palm oil and vegetable oil should be moderately used particularly in foods already generous in animal fats or nut- and seed-based ingredients which are rich in fat in order to keep the fat consumption minimal and reduce its consequential health effect.

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