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(RESEARCH ARTICLE)

Nutritional content of food served to pupils in National School Feeding Programme (NSFP) in Kaura Local Government, Kaduna State Nigeria

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Abstract

Nutritious food maintains good health, cognitive development, and academic performance in children, necessitating Nigeria's National School Food Programme (NSFP). Despite the economic growth observed in developing countries, malnutrition and particularly under nutrition is still highly prevalent. Therefore, assessing the food quality of the NSFP in terms of the nutritional content of food is essential at ensuring that the objective of improving access to education of the programme is achieved. This study assessed the nutritional content of food (proximate analysis) of food distributed to pupils by the NSFP in Bauchi local government, Bauchi state Nigeria. The study was a descriptive cross-sectional study and a simple random technique was used involving 17 schools and 5 different meals were sampled. Data were analyzed using descriptive statistics such as frequency tables and percentages. The result revealed that beans were mostly consumed. 0.04%-0.3%, 71.66%-75.56%, 0.02%. -0.6%, 6.2%-10.1%, and 15.7%-19.2 % in carbohydrate, protein, lipid, ash and moisture respectively while the nutritional content of white rice ranged from 73.6%-78.22%, 0.02%-0.7%, 0.2%. -0.7% ,7.2%-9.1% and 13.7%-17.5% in carbohydrate, protein, lipid, ash and moisture respectively. Also, the nutritional content of yam and stew served ranged from 70.71%-75.14%, 0.02%-0.4%, 0.12%.-0.56%, 7.7%-10.2% and 14.6%-18.9 % in carbohydrate, protein, lipid, ash and moisture respectively while the nutritional content of jollof rice ranged from 72.24%-74.13%, 0.05%-0.06%, 0.2%.-0.56% ,8.0%-9.3% and 16.2%-19.5% in carbohydrate, protein, lipid, ash and moisture respectively and nutritional content of yam and oil ranged from 71.0%-85.3%, 0.02%-0.8%, 0.03%.-1.2% ,1.63%-11.0% and 9.0%-17.0% in carbohydrate, protein, lipid, ash and moisture respectively. Most of the meals are high in carbohydrates and moisture with low protein. On the contrary, the quality, quantity and low in protein diets are of great health concern if the consumption of the foods were not complemented.

Keywords: Proximate analysis; Nutritional content; Food quality; NSFP

1. Introduction

Food is an important basic necessity which is essential for health and wellbeing of humans therefore, assessing the quality of food includes food hygiene practices, personal hygiene by food handlers, nutritional content of food and safe food handling and is more than just being clean [1]. Despite the fact that access to education is steadily expanding across developing countries with enrollment in a higher education rising sharply, a number obstacles such as poverty and hunger still kept about 67million children of Primary School age out of school of whom 43% are in Africa [2]. School Feeding Programme has been adopted in many countries throughout the world to fight short-term hunger by ensuring at least one daily nutritious meal to support access to education. In 2005, the Federal Government of Nigeria launched the School Feeding Programme with the assistance of the United Nations' Children Education Fund (UNICEF) and the New Partnership for Africa's Development (NEPAD).

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Nigeria happened to be one of twelve (12) pilot countries invited to implement the programme. So far, Nigeria, Cote d'ivore, Ghana, Kenya and Mali commenced the implementation of the school feeding programme. As a result, the Federal Government came up with the Universal Basic Education Act in 2004, which provided the enabling legislative backing for the execution of the Home-Grown School Feeding and Health Programme. Towards the realization of the objectives of the Universal Basic Education programme and the central role of nutrition, the Federal Ministry of Education first launched the Home-Grown School Feeding and Health Programme in 2005. The overall goal of the School Feeding Programme in Nigeria is to reduce hunger and malnutrition among schoolchildren and enhance the achievement of Universal Basic Education [3]. In 2004, the Federal Government of Nigeria piloted the implementation of Home-Grown School Feeding (HGSF). The Federal Ministry of Education was the designated implementing agency for a phased-pilot rollout, beginning with 12 States and the Federal Capital Territory (FCT) selected from the six geopolitical zones [4].

Nourishing status is one of the markers of the nature of physical and mental improvement of the school aged child. Physical development assessment is one of the worthy instruments for evaluating the kid's condition of sustenance. Physical development outlines the person's dietary status as well as straightforwardly mirrors the financial status of the family, social well-being of the network just as the productivity of the human services framework, and the impact of the encompassing environment [5].

The pyramid nourishment direction framework, which mirrors the suggestions of the dietary rule for Americans, gives data on the measures of sustenance prescribed for utilization to advance heath and diminish danger of incessant infections. Schools can make imperative commitments to enhance children's feast and supplement consumption. School-matured children spend something like 6hour at school each school day and got up to 47% of their calories from dinners and snakes devoured at school [6].

Since no protein is completely used, required support protein admission is constantly higher. Applying net protein usage (NPU) of 0.6, which is generally halfway between the most astounding and least protein NPU in food viewed as a huge protein source, gives as required every day support protein admission of 0.75 g/kg (0.34 g/pound) of fit body weight. Subsequently, the FAO/WHO/UNU [1] prescribed day by day protein consumption 0.75 g/kg of slender body weight. Starting with the sheltered least of 750 mg/kg/day of protein, 84 mg of which are basic amino acids, the expansion to 187mg aggregate of fundamental amino acids would take us to 853 mg/kg of all out protein (which would have to some degree higher relative basic amino corrosive content) [6]. This is just 14% higher than the old prerequisite. Be that as it may, since the decrease of relative necessity for methionine/ cysteine – which is constraining amino corrosive in almost immeasurably imperative protein sustenance sources aside from grains – would altogether enhance fundamental amino corrosive utilization, the new relative caloric protein prerequisite could be significantly littler than the former one. Taking all things together, this new example for imperative amino corrosive necessity, if right, still would not build the above adjusted off normal figure of 10% of complete calories. The child's diet must be satisfactory to help ordinary development and improvement, and suitable measures of minerals are required since an insufficient admission of specific minerals can deliver maladies and lead to strange advancement [7]. Great nutrition is a fundamental piece of sound children.

2. Material and methods

2.1 Description of study area

Kaura local government area is in Kaduna state, Northwest Nigeria and has its headquarters in the town of Kaura. Towns and villages that make up Kaura LGA include Garaji, FadanTakad, Bondong, Biniki, Fada, FadanAttakar, FadaCikiGari, and Zumuruk. The estimated population of Kaura LGA is put at 283,417 inhabitants with the vast majority of the area's dwellers being members of the Kamaku tribe. The Kamaku language is widely spoken in the area while the religion of Christianity is widely practiced in the area. Promient traditional rulers in Kaura LGA include the AkadTakad while popular festivals held in the area include the Afan cultural festival and the Kagoro cultural day. Kaura LGA covers a total area of 485 square kilometres and has an average temperature of 32 degrees centigrade. The area witnesses two distinct seasons which are the dry and the rainy seasons. The average wind speed in Kaura is put at 11km/h while the total rainfall in the area is estimated at 1000 mm of rainfall per annum.

2.2 Study design

A descriptive cross- sectional study was used to assess nutritional content of National School Feeding Programme. Advocacy visits was paid to the head masters of all the selected primary schools intimating them with the research and soliciting for their support.

2.3 Data collection

Food samples were collected in a sterile plastic plate with covers from forty different schools, kept into a cold box containing ice packs and transported to laboratory for each state and were all subjected to proximate analysis (carbohydrate, protein, ash, fat and moisture).

2.4 Nutritional content analysis

2.4.1 Materials Used

The materials used in these analyses was classified into two i.e consumables and non-consumables and are all of analytical grade.

Consumables: H_2S0_4, $CUS0_4$, $KS0_4$, NA0H, methyl orange indicator and petroleum ether.

Non- consumables: analytical balance, heating mantle, muffle furnace, desiccator, crucibles, tongs and spatula

2.4.2 Nutritional analysis of the school meal

The analysis carried out for the nutritional value includes: Moisture content, ash content, crude fat, crude protein and carbohydrates determination. The method adopted in the analysis was these of association of officials of analytical chemicals (AOAC 2002). Micro-Kjeldahl method was used for protein, dry ashing for ash, soxhlet extraction method for fat, hot air oven method for moisture, acid hydrolysis for crude fibre and carbohydrate was determined by difference.

Determination of moisture content

5g of the sample was placed porcelain crucible and heated dry air oven at 105°C for 2hrs. The sample was allowed to cool in dessicator. The weight of the samples not taking until a constant weight was obtained. The percentage moisture was obtained by the following expression:

$$\% \text{ moisture } = \frac{\text{W1} - \text{W2} \times 100}{\text{W1} - \text{W0}}$$

Were:
W0= weight of empty crucible
W1= weight of crucible + sample before heating
W2= weight of crucible + dried sample after heating

Determination of ash content

5g of the sample was placed in a crucible and ignited in a muffle furnace at 600°C for 2hrs. The ash was allowed to cool and the weight of the ash was taken. The percentage ash content was obtained from the following expression.

$$\% \text{ ash} = \frac{M_2 - M_0}{M_1 - M_0} \times 100$$

Where:
M0= weight of empty crucible
M1= weight of crucible + sample before obtaining
M2= weight of crucible + sample after obtaining

Determination of crude fat (lipid)

20 g of the sample was placed in a round bottom flask 200 ml petroleum ether was placed in the flask, a reflux condenser was mounted on the mouth of the flask and was heated at 60°C for 5hrs. Completion of the extraction, the flask was disconnected and extract was transferred in to a 250 ml beaker and the solvent was allowed to evaporate. The weight of the beaker and the fat was recorded until a constant weight was obtained. Increase in the weight of the beaker gave the weight of the crude fat was obtained from the following expression:

$$\% \text{ crude fat } = \frac{\text{B1} - \text{B0}}{\text{Bs}} \times 100$$

Where: B_0 = weight of empty beaker
B_1= weight of beaker + crude fat
Bs = weight of the sample

Determination of crude protein

Determination of crude protein involves 3 stages:

Stage 1: Digestion of the organic material (converting organic nitrogen in to medium).
Stage 2: Distillation of the released ammonia in to an absorbing surface or medium.
Stage 3: Titration of the ammonia formed during digestion.

- Digestion

Exactly 2.0g of the sample was weight and placed on to cleaned dried digestion tube. A Rpantufult of Kjedhal catalyst (CuSo4and KSo4) in the ratio of 10:1 respectively was placed in to each of the tube about 20.0ml of concentration H2So4 was then added. The digestion tube was then placed on a digestion block of heating mantle (PEC MEDICAL USA) in saluting position and digested feist at 150°C and later the temperature was rose to 300°C until clear solution was obtained and allowed cool.

- Distillation

The digest was then filtered and made up to 100ml with distilled water, 200ml of the diluted digested water, 20ml of the diluted digest was pipette in to round bottom flask containing anti bumping clips and 30ml of 40% NaoH was slowly added in to the flask.

A 250ml conical flask containing a mixture of 20ml 2% boric acid (H3Bo3) and four drops of methyl orange indicator was used to trap ammonia. The flask was heated on the heating mantle after connecting it to a condenser. The distillation was continued until boric acid solution completely changed from purple colour greenish yellow.

- Titration

The boric acid mixture (containing ammonium borate complex formed) was then titrated with IM HCL to colourless end point and the titles value was noted. The total organic nitrogen (TON) was then calculated thus:

$$\text{TON } = \frac{0.14 \times M_X \ (T_V - B_V)}{W_S}$$

$$\% \text{ Crude protein} = \text{TON} \times 6.25$$

Where:
V_a=Adequate value distilled; M = Molarity of acid; Tv = Title value; Br = Blank value; Ws = weight of sample

Determination of carbohydrate

The total carbohydrate content was determined by difference. The sum of the percentage moisture, ash, crude lipid and protein was subtracted from 100% carbohydrate.

$$\text{Carbohydrate } = 100 - (\% \text{ moisture}, + \% \text{ ash } + \% \text{ lipid } + \% \text{ protein } + \% \text{ fiber})$$

2.5 Data management, data analysis and data presentation

Data generated from the analysis were expressed in tables and percentages.

3. Results

Table 1 Promixate analysis of food sampled in Kaura local government

S/N	Sample	Moisture (%)	Ash (%)	Lipid (%)	Protein (%)	Carbohydrate (%)
1	(A) Beans	18.20	9.00	0.60	71.90	0.30
	(B) Yam & oil	18.00	8.00	0.50	0.40	73.10
2	(A) Rice & Stew	16.20	9.10	0.70	0.04	73.60
	(B) Beans	17.20	8.20	0.50	73.83	0.30
3	(A) Jollof rice	17.00	8.20	0.56	0.40	73.60
	(B) Beans	16.90	9.00	0.05	73.80	0.30
4	(A) Rice & Stew	16.00	9.00	0.43	0.70	73.87
	(B) Beans	17.00	8.20	0.60	73.18	0.02
5	(A) Yam & Oil	18.01	7.70	0.56	0.02	73.71
	(B) Beans	17.01	6.70	0.45	75.54	0.30
6	(A) Beans	16.70	8.30	0.60	74.30	0.10
	(B) Rice &Stew	15.80	9.01	0.34	74.15	0.70
7	(A) Jollof rice & meat	16.20	9.30	0.32	0.05	74.13
	(B) Beans	17.00	10.01	0.20	72.49	0.30
8	(A) Yam & egg	19.30	7.90	0.60	0.30	71.90
	(B) Beans	18.20	9.20	0.06	72.34	0.20
9	(A) Beans	15.70	8.01	0.50	75.75	0.04
	(B) Yam & oil	18.02	10.01	0.30	0.50	71.62
10	(A) Rice & Stew	17.30	8.50	0.06	0.05	74.09
	(B) Yam & Oil	16.00	9.00	0.20	74.45	0.35
11	(A) Beans	18.00	8.20	0.10	73.60	0.10
	(B) Beans	18.50	9.00	0.04	0.20	72.26
12	(A) Rice & Stew	17.50	7.50	0.34	0.02	74.64
	(B) Beans	16.50	9.00	0.30	74.16	0.04
13	(A) Yam & Stew	14.60	10.00	0.20	0.06	75.14
	(B) Rice &Stew	13.70	8.00	0.20	78.22	0.06
14	(A) Jollof rice	19.50	8.00	0.20	0.06	72.24
	(B) Beans	21.00	7.20	0.04	0.10	71.66
15	(A)Rice & Stew	15.90	7.20	0.43	0.02	76.45
	(A)Beans	17.80	6.30	0.30	75.56	0.04
16	(A) Beans	19.20	6.20	0.04	74.36	0.20
	(B) Yam & stew	18.90	10.20	0.12	0.07	70.71
17	(A)Rice & Stew	15.80	8.50	0.03	0.42	75.25
	(B)Beans	16.20	9.20	0.02	74.71	0.05

4. Discussion

In white rice, the nutritional content ranged from; carbohydrate - 62.32%-83.41%, protein - 0.01%-2%, lipids - 0.02%-0.7%, ash - 1.0%-13% and moisture - 10.8%-30.6% which affirms with [8] study (nutrient composition of some foods from a Nigerian eatery) which states that moisture and Ash content ranged from 14% to 40 % and from 1.3 to 3.8% respectively.

In yam, nutritional content ranged from 70.71%-81.66% in carbohydrate, 0.02%-1.02% in protein, 0.01%.-1.2% in lipid,1.75%-12% in ash and 11 %-20 % in moisture which is in line with [9] (Proximate and anti-nutrient composition of white Guinea yam (*Dioscorearotundata)* diet consumed in Ibarapa, South West region of Nigeria) study that showed that crude protein ranged from 0.11% to 0.05% and crude fat ranged from 0.03 to 0.10% while carbohydrate ranged from 41.86%to 68.57% which was slightly different from this study.

In beans, nutritional content ranged from 0.03%-1% in carbohydrate, 58.59%-83.1% in protein, 0.02%-2% in lipid, 2.2%-10% in ash and 8%-32.7 % in moisture. The moisture and ash content of [10] (Proximate composition and sensory assessment of beans) that ranged from 69.10% to 71.89%, and 1.68% to 1.90%, which contradicts this result while the fat content ranged from 2.27% to 2.72% which is slightly different to my result. The carbohydrate and protein content ranged from 0.05% t0 2.8% and 62.35% t0 86%, respectively, which is in line with this study.

In Jollof rice, nutritional content ranged from 72.24%-74.13% in carbohydrate, 0.05%-0.06% in protein,0.2%-0.56% in lipid,8.0%-9.3% in ash and 16.2%-19.5 % in moisture, which contradicts a study done by [11] (Macro-nutrient composition of vegetarian meals consumed by undergraduate students of Babcock University) and showed that carbohydrate, protein, lipid, ash and moisture content is 29.21%,7.76%, 3.90%, 2.48%and 55.9% respectively.

5. Conclusion

The findings ofthis study revealed that watery beans were the most consumed food. Most of the meals are high in moisture with little or low protein but possess some inherent nutritional qualities that could enhance proper growth and development in Nigerian context. On the contrary, the quality, quantity and low in protein diets are of great health concern if the consumption of the foods were not complemented. The study apart from providing an insight into nutrient content of foods from National School Feeding Programme, it also shed light on the fact that fast foods could not be totally regarded as unwholesome in terms of nutrient content however, adequacy of intake must also take into account of both the portion size and frequency of consumption in the daily diet.

Compliance with ethical standards

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Disclosure of conflict of interest

We have no conflicts of interest to disclose**.**

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