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Nutritional content of food served to pupils in national school feeding programme (NSFP) in Bauchi local government, Bauchi 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 40 schools and three different meals were sampled. Data were analyzed using descriptive statistics such as frequency tables and percentages. The result revealed that beans were mostly consumed. 0.02%-1%, 58.37%-83.1%, 0.01%.-2%, 1.7%-10.%, and 8%-80.83 % in carbohydrate, protein, lipid, ash and moisture respectively while the nutritional content of white rice ranged from 53.0%-86.69%, 0.01%-2.0%, 0.01%.-3.0%,1.0%-13.0% and 1%-34% in carbohydrate, protein, lipid, ash and moisture respectively. Also, the nutritional content of yam served ranged from 70.71%-82%, 0.02%-1.02%, 0.01%.-1.2%, 1.75%-12% and 11%-32.1 % 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

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(According to W.H.O).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 (Hakeem, 2017). 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).

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 (Afolaranmi *et al.*, 2015) [2]. 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 (NHGSF, 2016).

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 (Chandramohan *et al.*, 2015) [4].

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 (US Department of Agriculture, 2008) [8]. 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 (Condon *et al.*, 2011) [5]. 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 sources, 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 (World Health Organization, 2007) 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 187 mg 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) (Condon *et al*, 2011) [5]. 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 (Camara *et al.,* 2007) [3]. Great nutrition is a fundamental piece of sound children.

Materials and Method

1. Description of Study Area

Bauchi is a city in northeast Nigeria, the capital of Bauchi State, of the Bauchi Local Government Area within that State, and of the traditional Bauchi Emirate. It is located on the northern edge of the Jos Plateau, at an elevation of 616 m. The Local Government Area covers an area of 3,687 km^2 and had a population of 493,810 at the time of the 2006. The Bauchi local government area where this research was carried out is located within Bauchi state in the North east region of Northern Nigeria. It shares boundaries with Alkaleri, Ganjuwa, Toro and Tafawabalewa local government.The Bauchi local government has a population of 493,810 according to census 2006 and area covered by 3,687km.

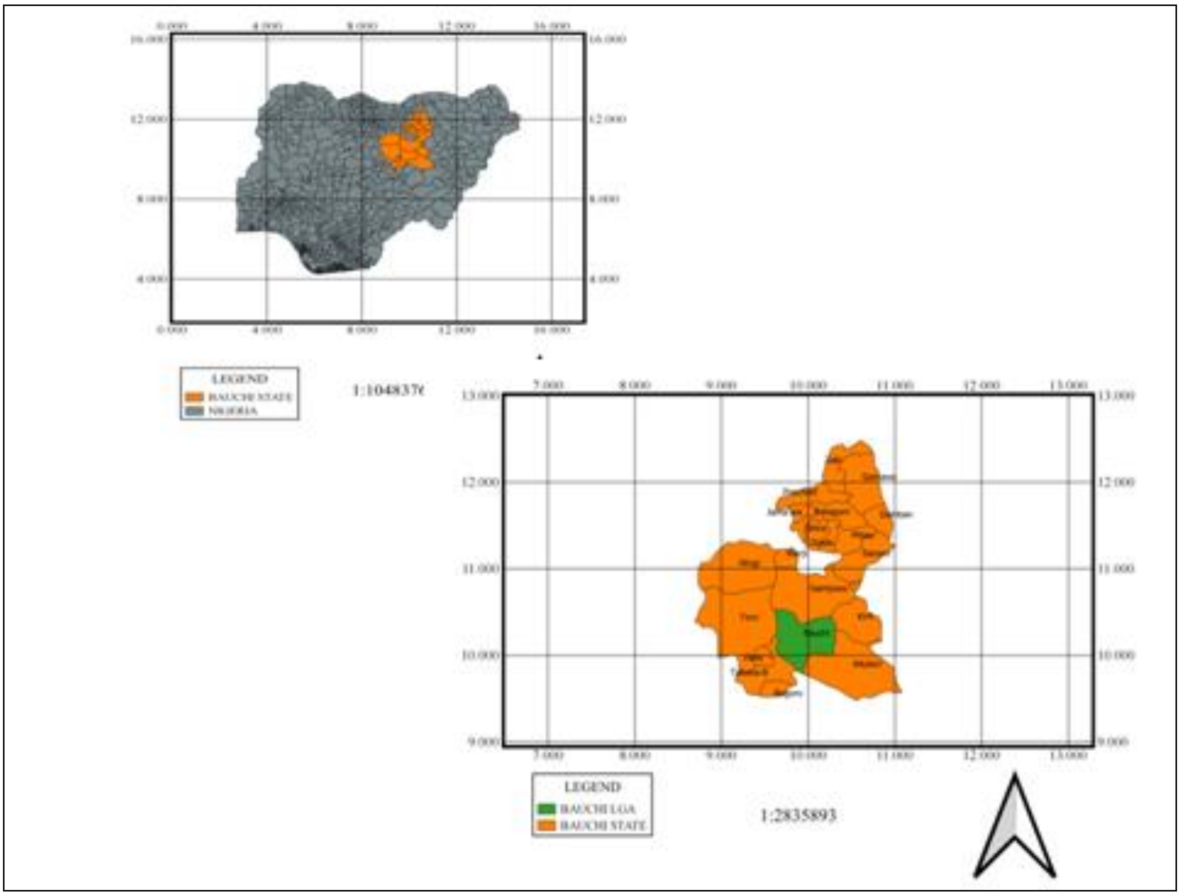

Fig 1: Map of study area

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.

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).

4. Nutritional Content Analysis

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, dessicator, crucibles, tongs and spatula

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.

1. Determination of Moisture Content

5g of the sample was placed porcelain crucible and heated dry air oven at 105C° 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:

% moisture = W1-W2×100

W1-W0

Where:

W0= weight of empty crucible

W1= weight of crucible + sample before heating

W2= weight of crucible + dried sample after heating

2. Determination of ash content

5g of the sample was placed in a crucible and ignited in a muffle furnace at 600C° 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.

% ash= M_2-M_0× 100

M_1- M_0

Where:

M0= weight of empty crucible

M1= weight of crucible + sample before obtaining

M2= weight of crucible + sample after obtaining

3. Determination of crude fat (lipid)

20g of the sample was placed in a round bottom flask 200ml petroleum ether was placed in the flask, a reflux condenser was mounted on the mouth of the flask and was heated at 60C° for 5hrs. Completion of the extraction, the flask was disconnected and extract was transferred in to a 250ml 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:

% crude fat =B_1 - B_0×100

Bs

Where: B_0 = weight of empty beaker

B_1= weight of beaker + crude fat

Bs = weight of the sample

4. 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.

a. 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 150C° and later the temperature was rose to 300C° until clear solution was obtained and allowed cool.

b. 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.

c. 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:

$$TON = \frac{0.14 \times Va \times Mx\ (Tv - Bv)}{Ws}$$

% crude protein = TON × 6.25
Where:
V_a=Adequate value distilled
M = Molarity of acid
Tv = Title value
Br = Blank value
Ws = weight of sample

5. 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.

Carbohydrate = 100 - (% moisture, + % ash +% lipid +% protein +% fiber)

4.3 Data Management, Data Analysis and Data Presentation
Data generated from the analysis were expressed in tables and percentages.

Result and Discussion

Table 1: Promixate Analysis of Food Sampled In Bauchi Local Government

S/N	Food item(s)	Moisture content (%)	Ash content (%)	Protein (%)	Fat (%)	Carbohydrate (%)
1	(A) Rice (B) Beans	13.00 10.00	7.00 7.00	2.00 80.00	3.00 2.00	75.00 1.00
2	(A)Rice (B) Yam	10.00 16.00	8.00 10.00	2.00 0.90	3.00 0.30	77.00 72.00
3	(A) Yam (B) Rice	12.00 10.00	12.00 13.00	0.80 0.30	0.20 0.10	75.00 76.60
4	(A) Rice (B) Beans	17.00 15.50	7.00 5.00	0.50 79.0	0.20 0.11	78.30 0.30
5	(A)Rice (B) Beans	10.00 16.00	8.00 4.00	0.30 79.70	0.10 0.20	81.60 0.20
6	(A) Beans (B) Rice	17.00 12.00	7.00 8.00	75.76 0.42	0.20 0.13	0.04 79.45
7	(A) Yam (B) Rice	20.00 16.00	3.00 4.00	0.06 0.04	0.11 0.02	76.83 79.94

8	(A) Yam (B) Beans	16.23 15.62	2.35 3.34	0.44 80.95	0.04 0.06	80.94 0.03
9	(A) Rice (B) Beans	14.25 15.72	2.72 2.92	0.60 80.83	0.02 0.03	82.41 0.50
10	(A)Yam (B) Beans	17.00 17.05	3.00 4.01	1.02 78.76	0.01 0.13	78.97 0.05
11	(A) Rice (B) Beans	14.78 15.35	3.11 3.13	0.12 80.88	0.01 0.01	81.98 0.63
12	(A) Yam (B) Beans	16.02 15.25	2.92 3.10	0.33 81.38	0.03 0.04	80.70 0.23
13	(A) Rice (B) Rice	14.85 14.78	3.26 3.26	0.42 0.3	0.02 0.06	81.45 81.87
14	(A) Yam (B) Rice	16.05 15.99	2.75 4.35	0.06 0.33	0.04 0.12	81.11 79.21
15	(A) Beans (B) Yam	15.60 17.65	3.65 3.20	79.72 0.03	1.00 0.02	0.03 79.10
16	(A) Rice (B) Beans	16.03 18.01	3.04 2.22	0.45 79.62	0.03 0.12	80.45 0.03
17	(A)Yam (B) Rice	18.00 15.92	2.00 3.00	0.70 0.03	0.03 0.02	79.27 81.03
18	(A) Rice (B) Beans	16.00 18.02	2.56 3.01	0.44 78.88	0.31 0.03	86.69 0.06
19	(A) Beans (B) Yam	16.03 14.78	2.65 3.16	81.08 0.03	0.13 0.03	0.11 81.97
20	(A) Beans (B) Beans	17.00 16.35	3.78 4.00	78.84 79.53	0.32 0.07	0.06 0.05
21	(A) Beans (B) Rice	18.00 12.00	7.00 8.00	74.76 0.42	0.20 0.13	0.04 79.45
22	(A) Yam (B) Beans	14.78 16.03	3.16 2.65	0.08 81.08	0.03 0.13	81.07 0.11
23	(A) Rice (B) Yam	15.92 18.00	3.00 2.00	0.02 0.03	0.03 0.70	81.03 79.27
24	(A) Rice (B) Beans	14.25 15.72	2.72 2.92	0.02 80.83	0.60 0.03	82.41 0.50
24	(A) Rice (B) Beans	14.00 17.00	7.00 5.00	0.20 77.60	0.50 0.10	78.30 0.30
26	(A) Beans (B) Rice	17.00 12.00	7.00 8.00	75.76 0.13	0.20 0.42	0.04 79.45
27	(A) Rice (B) Beans	14.00 17.00	7.00 5.00	0.20 77.60	0.50 0.10	78.30 0.30
28	(A) Yam (B) Rice	15.92 18.00	3.00 2.00	0.02 0.03	0.03 0.70	81.03 79.27
29	(A) Rice (B) Beans	12.00 10.00	8.00 7.00	0.13 80.00	0.42 2.00	79.45 1.00
30	(A) Beans (B) Yam	16.03 14.78	2.65 3.16	81.08 0.06	0.13 0.03	0.11 81.07
31	(A) Yam (B) Yam	16.05 16.02	2.75 2.92	0.04 0.03	0.06 0.33	81.11 80.70
32	(A) Beans (B) Beans	17.00 16.35	3.78 4.00	78.84 79.53	0.32 0.07	0.06 0.05
33	(A) Rice (B) Rice	14.85 14.78	3.26 3.26	0.42 0.3	0.02 0.06	81.45 81.87
34	(A) Yam (B) Beans	14.78 16.03	3.16 2.65	0.08 81.08	0.03 0.13	81.07 0.11
35	(A) Rice (B) Beans	14.00 12.00	8.00 7.00	0.13 77.00	0.42 2.00	77.45 2.00
36	(A) Yam (B) Rice	15.92 17.00	3.00 3.00	0.02 0.03	0.03 0.70	81.03 79.27
37	(A) Yam (B) Beans	14.78 17.03	3.16 1.65	0.08 81.08	0.03 0.13	81.07 0.11
38	(A) Rice (B) Beans	16.00 17.00	6.00 5.00	0.20 77.60	0.50 0.10	77.30 0.30

39	(A) Beans (B) Beans	17.03 15.62	3.78 3.35	78.84 80.95	0.31 0.06	0.04 0.02
40	(A) Yam (B) Rice	16.05 15.99	2.75 4.35	0.04 0.12	0.06 0.33	81.11 79.21

Discussion

In white rice, nutritional content ranged from; carbohydrate - 53%-86.69%, protein - 0.01%-2%, lipids - 0.01%.-3%, ash - 2.0%-13.0%, moisture - 10.0%-34% which contradicts with Ngozi *et al.,* 2017 (Macro-nutrient composition of vegetarian meals consumed by undergraduate students of Babcock University) reported that carbohydrate, protein, lipid, ash and moisture content is 13.33%,5.8%, 7.6%, 1.85%and 70.3% respectively.

In yam, nutritional content ranged from 72%-82% in carbohydrate, 0.02%-1.02% in protein, 0.01%.-0.9% in lipid, 2.3%-8% in ash and 12%-32.1 % in moisture which contradicts a study done by Ngozi *et al., 2017* (Macro-nutrient composition of vegetarian meals consumed by undergraduate students of Babcock University) and showed that carbohydrate, protein, lipid, ash and moisture content is 40.4%, 4.6%, 0.42%, 1.9%and 51.3% respectively.

In beans, the nutritional content ranged from 0.02%-1% in carbohydrate, 58.37%-81.8% in protein, 0.01%.-2% in lipid, 1.7%-9.% in ash and 10%-80.83 % in moisture which contradicts with a study done by Adepoju and Etukumoh 2014 (Nutrient composition and suitability of four commonly used local complementary foods in Akwa Ibom state, Nigeria) and showed that carbohydrate, protein, lipid and ash is 16.9%,6.70%, 7.23% and 0.38% respectively. Although, the moisture content was 68.59% and is in line with my study.

Conclusion

The findings of this study revealed that watery beans was 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.

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