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Nutritional Requirement of Target Population Groups in the Developing Countries: A Case Study of Amala Served with Okro Soup and Jollof Beans

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Abstract: Nutritional requirement of target population groups in the developing Countries was investigated. Two commonly affordable meals (Amala served with okro soup and Jollof beans) were analyzed and the percentage macronutrients obtained in them were converted to grams. The percentage wet weight composition (2.25, 0.67, 32.09 and 3.06, 3.28, 12.69) were found to be equivalent to 4.97, 1.39, 70.85 and 8.22, 8.81, 34.09 g of fat, crude protein and carbohydrate from Amala and Jollof beans meals respectively. The energy content (Kcal) from carbohydrate, the primary source of energy for Amala and Jollof beans meals was determined and found to be 283.42 and 136.34 respectively. These results were then compared with the Standard Recommended Allowance and the Standard Energy/Calorie Requirements for different age groups. The results obtained revealed that these meals did not meet the nutritional requirements of any of the different age groups. This may definitely have advert effects on these population groups.

Key words: Age groups, meals, nutrients, standard and developing countries

INTRODUCTION

Nutritional studies are frequently designed and carried out to examine the quantity and quality of nutrients present or available in food samples. In developing countries, the tendency or emphasis is now drifting from the quality (i.e. adequate proportions of nutrients) of food taken to the quantity. This has led to some diseases which could have been prevented by effective feeding in such countries. A thorough knowledge of the importance of these nutrients and their easily accessible sources will go a long way to help correct the situation (Karger, 1979). Human body needs nutrients to help the body for the production of energy to meet the demands of everyday physical activities and ensure mental efficiency, growth and development (Wiley, 1977). For man, the sole source of nutrients is food (Sinclair and Howat, 1980). A person who is hungry and sluggish due to lack of energy cannot do anything effectively (Marralle *et al*., 1986). This situation is compounded by lack of awareness of the Public on the nutritive values of a number of food items that are readily available but not generally consumed. Several people are ignorant of the nutrients they could derive from the consumption of certain foods.

A lot of work has been done on chemical composition of Nigerian foods (Oyenuga, 1978; Osifo, 1970; Oke and Ojofeitimi, 1984). In developing Countries like Nigeria, many foods put up for sales to the public lack standard both in term of quality and quantity. For instance, a loaf of bread bought in this Country does not even have a standard weight. To the average consumers in Nigeria, these determinations have little, if any meaning to their diets; hence the problem of malnutrition especially in children is one of great concern (Oke and Ojofeitimi, 1984). According to Sir Robert Namara (1973), President of the World Bank in an address to his board of governors on the World food situation, "….Malnutrition is widespread, it is a major cause of high mortality among young children, it limit the physical and mental growth of hundreds of millions of those who survive it, reduces their productivity as adults"; it is therefore a major barrier to human development. Although the causes of malnutrition are not always based on food availability or economic circumstances alone in the developing Countries; choice of food is strongly influenced by religion, custom, habit and prejudice, all of which stem from the particular cultural pattern and often result in poor selection of food and hence poor feeding practices (Allan, 1971; Casper and Waker Field, 1976; Alfred and Bogi, 1986). Hence, man must eat "good" food to grow and to live through the rigors of life. A "good" food is the one that contains the nutrients in the required proportions. i.e. balanced diet (Oyeleke, 1984).

This study was therefore undertaken to determine the nutrient (macronutrient) compositions of Amala served with okro soup and Jollof beans that are commonly consumed in almost all parts of Nigeria and other developing Countries and to relate the nutrients so determined with the standard calorie requirements for different population groups.

MATERIALS AND METHODS

Source of material: The two meals were obtained from Ikeji-Arakeji, Osun State, Nigeria.

The samples were dried in an Oven and the dried materials were grounded in a mortar into powdered

forms and then stored at low temperature in desiccators until required. Proximate analysis was carried out with 0.3g each of the two meals using A.O.A.C. (2005) methods. The determinations were made only on dry samples except moisture determination and the results were obtained in terms of dry weight and wet weight of the samples. Carbohydrate, protein, fat, fibre, ash and water contents of the meals were estimated.

RESULTS AND DISCUSSION

The proximate analyses of Amala served with okro soup (no meat) and Jollof beans are shown as Table 1 (dry weight basis) and Table 2 (wet weight basis) respectively.

Table 1: Proximate Compositions of Amala Served with Okro Soup and Jollof Beans (Dry Weight)

	Samples (%)	
	Amala meal	Jollof Beans meal
Total Weight (g)	220.80	268.60
Moisture (%)	61.80	79.60
Ash (%)	2.19	5.00
Fibre (%)	6.15	1.73
Fat (%)	5.90	15.00
Crude Protein(%)	1.76	16.06
Carbohydrate	84.00	62.21

Results are expressed as means of five determinations (Appendix 1).

Table 2: Proximate Composition of Amala Served with Okro Soup and Jollof Beans (Wet Weight)

	Samples (%)	
	Amala meal	Jollof Beans meal
Total Weight(g)	220.80	268.60
Moisture (%)	61.80	79.60
Ash(%)	0.84	1.02
Fibre(%)	2.35	0.35
Crude fat (%)	2.25	3.06
Protein (%)	0.67	3.28
Carbohydrate	32.09	12.69

Results are expressed as means of five determinations (Appendix 2)

Although the analyses (except moisture determination) were done of dry samples, it is only reasonable to convert the results to wet weight (as shown in appendix 2) since meals are consumed in wet forms.

Emphasis is placed on the wet weight data for the discussion of the results because meals are taken in such forms. Nutrients (in grams) and derivable energy (Table 3) from the meals were compared with the Recommended Dietary Allowance (Table 4) and the standard energy/calorie requirements for different age groups (Table 5) respectively.

The large percentages of moisture contents of Amala served with okro soup (61.80%) and Jollof beans (79.60%) were expected because cooking is always done with water. The ash content of Jollof beans (5.00%) was high compared to that of Amala served with okro soup (2.19%). This may possibly be due to high amount of salt (and at time potash) added during preparation of Jollof beans. However, this amount may vary from one person to another since addition of salt, potash and other condiments to foods during cooking depends on the taste of individuals. The high value of lipid content of Jollof beans (15.00%) was not surprising due to the fact that a lot of palm oil must have been used to prepare the meal. However, the lipid content of Amala served with okro soup (5.90%) must have come mainly from the oil added to the okro soup. Jollof beans is a protein-rich meal, hence, its high percentage (16.06%) compared with that of Amala served with okro soup (1.76%), a rich source of carbohydrate.

Table 3: Macronutrients derived from Amala Served with Okro Soup and Jollof Beans (g) and derivable calorie from carbohydrate only (Kcal)

	Samples	
	Amala meal	Jollof Beans meal
Total Weight	220.80	268.60
Moisture	136.45 (61.80%)	213.81 (79.60%)
Ash	1.85	2.74
Fibre	5.19	0.93
Fat	4.97 (2.25%)	8.22 (3.06%)
Crude protein	1.39	8.81
Carbohydrate	70.85	34.09
Derivable Calorie*	283.42	136.34

*Calorie derivable from carbohydrate only (Appendixes 3 and 4)

Table 4: Recommended Dietary Allowance (RDA) of different nutrients

Nutrients	RDA
Water	3.7 L/day
Carbohydrate	130g/day
Protein	56g/day
Fibre	38g/day
Fat	20-35% of calories

Source: Institute of Medicine of the National Academy of Science (13th August, 1997), Washington

The estimated amount of energy from carbohydrate part of the meals was 283.42 and 136.34 Kcal. in Amala served with okro soup and Jollof beans respectively. The difference in calorie arises from the difference in caloric values of the starting raw materials. The Amala which is a condensed source of carbohydrate, an energy giving diet, was made from yam, while Jollof beans was prepared with oil and beans, a diet that is richer in protein (Baptist, 1984). Another nutritional importance of the carbohydrate load of these meals is that not all carbohydrate is available for energy, since energy from fibre was not estimated, hence the caloric value obtained.

The nutrient composition and the subsequent nutritional value of any food depend on the type of raw materials used and the method of preparation (Oguntona and

Table 5: Standard energy/calorie requirements for different age groups with typical day-to-day life style (Kcal)

Gender	Age (Years)	Sedentary[a]	Moderately Active[b]	Active[c]
Child	2-3	1000	1000-1400	1000-1400
	4-8	1200	1400-1600	1400-1800
	9-13	1600	1600-2000	1800-2200
Female	14-18	1800	2000	2400
	19-30	2000	2000-2200	2400
	31-50	1800	2000	2200
	51 +	1600	1800	2000-2200
Male	4-8	1400	1400-1600	1600-2000
	9-13	1800	1800-2200	2000-2600
	14-18	2200	2400-2800	2800-3200
	19-30	2400	2600-2800	3000
	31-50	2200	2400-2600	2800-3000
	51 +	2000	2200-2400	2400-2800

Source: Dietary Guidelines for Americans, 2005. a-Sedentary means a lifestyle that includes only the light physical activity associated with typical day-to-day life. b - Moderately active means a lifestyle that includes physical activity equivalent to walking about 1.5-3 miles per day at 3-4 miles per hour, in addition to the light physical activity associated with typical day-to-day life. c- Active means a life style that includes physical activity equivalent to walking more than 3 miles per day at 3-4 miles per hour, in addition to the light physical activity associated with day-to-day life

Zubir, 1986). In addition, what an individual feeds on is further determined by the available foods and his socio-economic status (Casper and Waker Field, 1976; Alfred and Bogi, 1986). However, the general consideration in meal selection is whether the food class (es) meet the nutritional requirements necessary for normal growth of the relevant population groups.

Comparing the results (Tables 2 and 3) obtained from this study with the Recommended Daily Allowance (RDA) of different nutrients (Table 4) and energy requirements of the various age groups (Table 5), it becomes obvious that the energy derived from Amala served with okro soup and Jollof beans is grossly inadequate for these age groups. Moreover, it does not meet the energy demand of any persons. When viewed against the background that the analyzed meals were meant for the adults who are always involved in farming activities and other hard labour, it therefore becomes glaring that their energy needs cannot be met. The total amount of carbohydrate that is derivable from Amala served with okro soup and Jollof beans is 70.85 g and 34.09 g which corresponds to 283.42 and 136.34 Kcal respectively (Appendix 3 and Table 3). This is grossly inadequate for the population groups that the meals are meant for. The consequence of this may lead to malnutrition (FAO, 1972; 1974) especially in children, a major cause of high mortality among young children. Furthermore, other inadequate nutrient like proteins may be channeled to meet the energy needs/demands while that of fats and oils in the diet may lead to malformation of the brain. This may also limit the physical and mental growth of many children who survive it and reduces their productivity as adults (Sir Robert, 1973). This may be a major barrier to human development.

Conclusion: The results obtained from this study compared with the information data on the standard nutritional requirements of different age groups (Tables 4 and 5) concluded that the meals did not meet the nutritional needs of individuals especially in terms of primary purpose of food-energy. The public in the developing Countries need to be educated on the importance of meal selection. They should be educated on the importance of balanced diet, especially the rural settings of these developing Countries. It is also important that consumers' multi-disciplinary scientific efforts be made at the Governmental level to solve food problem of substandard in quality in these Countries.

These levels are based on Estimated Energy Requirements (EER) from the Institute of Medicine Dietary Reference Intakes Macronutrients report, 2002.

APPENDIX 1

Calculation of percentage dry weight

$$\text{For Amala meal, Standard absorbance} = \frac{0.45 + 0.44}{2}$$

$$= 0.445$$

Absorbance obtained from the graph = 0.105 x 8* = 0.84

Therefore, 1 ml of the sample solution contained 0.84mg of carbohydrate. Then 250ml of the sample solution would contain 0.84 x 250 = 210mg/250 ml.

$$\text{Percentage of dry weight} = \frac{210x100}{250} = 84.00\%$$

* = Dilution factor.

Similarly, percentage dry weight of carbohydrate in Jollof beans meal = 62.21% e.t.c.

APPENDIX 2

Calculation of percentage wet weight: Calculation of percentage Wet weight of carbohydrate in Amala served with okro soup:

$$= \frac{84.00}{100} x \frac{(100\text{-}61.80^{*})}{1}\%$$

Percentage of wet weight = 32.09%
* = Moisture content
Similarly, percentage wet weight of carbohydrate in Jollof beans meal = 12.69% e.t.c.

APPENDIX 3

Estimation of the amount of the nutrients based on wet weights from the meals: 0.3 g of analyzed Amala meal sample contained 32.09% of carbohydrate. i.e. 32.09% of 0.3 g of analyzed sample is equivalent to 32.09/100 x 0.3 of carbohydrate = 0.09627 g.
Therefore if 0.3 g of analyzed sample contained 0.09627 g of carbohydrate, Then 220.80 g (total weight) of analyzed Amala meal would contain

$$\frac{0.09627 \text{ x } 220.80}{0.3} = 70.85472\,\text{g}$$

Similarly, amount of carbohydrate in Jollof bean = 34.08534 g e.t.c.

APPENDIX 4: Calculation of derivable calorie from carbohydrate content based on wet weight:

$$\text{Derivable calorie from Amala meal} = \frac{32.09 \text{x} 220.80}{100} \text{x } 4$$

$$= 283.42 \text{ Kcal}$$

1 g of carbohydrate is equivalent to 4 Kcal. i.e. 1 g = 4 Kcal. Therefore 70.85472* g = 4 x 70.85472 = 283.42 Kcal. Similarly, for Jollof beans meal, derivable calorie = 136.34 Kcal. *Obtained from Appendix 3.

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