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Full Length Research Paper

ASSESSMENT OF NUTRITIONAL COMPOSITION OF COMMERICALLY SOLD FISH BASED READY TO EAT FOOD (FISH ROLL) IN SOME PARTS OF LAGOS METROPOLIS, SOUTH WEST NIGERIA.

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ABSTRACT

Fish rolls are a popular value-added, fish based, ready-to-eat food snack sold in Lagos, South west Nigeria. The study was carried out to determine nutritional composition of commercially fish rolls available in some parts of Lagos metropolis. Six brands of fish rolls were collected and analyzed for proximate composition and energy values with a view to evaluate their levels of nutrients. The nutrient composition from the different brands of fish rolls analyzed were found to differ significantly ($P < 0.05$). The moisture, protein, lipid, ash, crude fiber and carbohydrate contents of the fish roll samples varied between 7.42-8.62g/100g, 27.69-36.78g/100g, 11.02-13.05g/100g, 1.42-3.24g/100g, 2.05-5.11g/100g, 31.27 - 44.94g/100g respectively, while energy content ranged from 396.34-419.77kcal. The results showed that the sampled fish rolls produced from different vendors varied in nutrient proportion. The nutrients in the fish snacks are inadequate to meet the daily recommended amounts of nutrient for daily use by the body. Thus, these snack food are considered unhealthy and it is recommended that their consumption be limited.

Keywords: Ready-to-eat, fish roll, nutritional composition, Lagos.

Introduction

In the last ten years, changes in life-style and eating patterns have led to a gradual increase in demand for snack foods. The snack food market is constantly changing relative to product types, although most snacks are not primarily consumed for their nutrients. The snack food industry is experiencing extraordinary changes from the consumer's point of view. Consumers want snacks that taste good and smell good, feel good, look good and in addition,

nutritionally superior and healthy. (Priyanka *et al.*, 2012)

Ready-to-eat foods can be described as the status of foods being ready for immediate consumption at the point of sale. Ready-to-eat foods could be raw or cooked, hot or chilled and can be consumed without further heat treatment (Tsang, 2002). Different terms have been used to describe such ready-to-eat foods. These include convenient, ready, instant and fast foods. Examples of such ready-to-eat foods include pastries such as meat pie, sausage rolls,

burger; moin-moin, salad or coleslaw, fried meat, fried chicken, milk and milk products (Caserani and Kinston, 1974). A general observation of our society shows a social pattern characterized by increased mobility, large numbers of itinerant workers and less family or home centered activities. This situation however has resulted in more ready-to-eat foods taken outside home.

As urban lifestyles get increasingly hectic, people no longer have enough time to cook meals at home. Rather, with less time, people are being forced to change their schedules, taste and attitudes towards food consumption (Pikuda and Ilelaboye, 2009). Since these snacks and fast foods are readily available, many of the urban residents, especially the middle class, the youth and the children, obtain a significant portion of their diet from snacks and fast foods sold cheaply on the street (Olutayo and Akanle, 2009). Consumption of snacks is thus becoming a passion as snacks are sold everywhere, and may be eaten at every meal time as well as in between meals.

Gatenby (1997) relates that most researchers define a snack as a smaller, less structured meal that is not eaten during regular meal times – breakfast (morning), lunch (afternoon) and dinner (evening). Snacks are appealing and easy to eat, of great taste and provide quick energy. But how wholesome and healthy are they? Unfortunately, while the passion for snacks and fast foods is on the increase, the health implications have not been properly grasped by the consumers. Snacking plays a dual role in the diet; it provides vital nutrients, yet it also increases calorie and fat intake. Howard and Reeves (2005) in a study of the diets of 28 adolescents (ages 11-14) found that snack foods significantly increase the total intake of vitamins and minerals such as iron, zinc, folate and calcium. However, the study also found that snacking contributes to excessive levels of fat in the body.

Sebastian, Cleveland and Goldman (2008) examined the 24-hour recall of food intake by 4,357 adolescents (12-19 years old) from the National Health and Nutrition Examination Surveys (2001-2004) and found that snacking frequently improved the likelihood of meeting fruit recommendations for both genders, while also helping boys meet the daily recommended intake for milk and oils. However, the study also reported that snacking significantly increases the intake of calories and sugars.

Cutting out unhealthy snacks and replacing them with healthy snacks can have a positive effect on people's health. Lloyd-Williams *et al.*, (2008) found out that replacing one unhealthy snack with one healthy snack daily can reduce 4.41 gram of saturated fat and 0.51 grams of sodium intake. Since increased saturated fat and salt intake are linked to cardiovascular disease, the change from unhealthy to healthy snacks is very beneficial (Lloyd-Williams *et al.*, 2008).

In the developed countries, much research has been done to determine the quality and nutritive values of snacks and fast foods (Pikuda and Ilelaboye, 2009; Olutayo and Akanle, 2009), and whereas for many local snacks which are readily available in Nigerian markets, much little work has been carried out on them and their nutritional values (Pikuda and Ilelaboye, 2009; Adeyeye and Adebisi, 2004; Aletobor and Ojelabi, 2007). Thus, the purpose of this study is focused on assessing the nutritional qualities and wholesomeness of a fish based ready-to-eat food snack (fish rolls) sold in some parts of Lagos, Southwest Nigeria.

MATERIALS AND METHODS

Sample collection

Samples of six different brands of fresh fish rolls (FR1, FR2, FR3, FR4, FR5, FR6) were purchased from different local kiosks at six

sites in Lagos. At each site of purchase, samples of snacks (fish roll) were obtained from different vendors, who were preparing the food snacks on site. The samples were aseptically collected in a clean polyethylene bag and transferred immediately to the laboratory for further analysis. These samples were all collected in the month of April, 2014.

Sample treatment

Ingredients: The ingredients for the preparation of fish roll were: fried fish, wheat flour, baking powder, butter, urban treated water, groundnut oil and table salt.

The fish roll samples were first oven dried at a temperature of 100°C for 1 hour. After drying, the

samples were milled into fine powder using a major blender. The samples were sieved and then stored in dry plastic bottles and then kept in a laboratory refrigerator for preservation pending analyses.

Sample analysis

Moisture, total ash, crude fiber and lipid extract of the samples were determined by the methods of the A.O.A.C (A.O.A.C. 1995). The protein was determined by multiplying percentage nitrogen by a factor of 6.25. Carbohydrate was determined by difference. The energy values (kcal/100g) were calculated by adding up the values

obtained for carbohydrate multiplied by factor 4, crude protein multiplied by factor 4 and crude fat multiplied by factor 9 for each of the samples. The results were expressed as means of triplicate determinations.

Statistical analysis: Data obtained were analyzed using SPSS (Statistical Package For Social Science) version 16.0 by one way analysis of variance (ANOVA) to assess the significance at $P < 0.05$. The means of treatment showing significant differences ($P < 0.05$) were subjected to Duncan's Multiple Range Test.

RESULTS

The proximate compositions of the fish snacks are as shown in Table 1. Moisture content of the fish roll samples ranged from 7.42 - 8.62g/100g while the lipid content of the samples ranged from 11.02 - 13.05g/100g. The ash and crude fiber contents of the fish based food snacks were between 1.42 - 3.24g/100g and 2.05 - 5.11g/100g respectively. The food snacks' carbohydrate content ranged from 31.27 - 44.94g/100g, while the protein content of the fish rolls had 27.69g/100g as the least value and 36.78g/100g as the highest value. Energy content of the fish roll snacks ranged from 396.34 - 419.77kcal/100

Table 1: Proximate composition and energy values of fish roll snacks.

Sample	Moisture (g/100g)	Protein (g/100g)	Lipid (g/100g)	Ash (g/100g)	Crude Fibre (g/100g)	Carbohydrate (g/100g)	Energy (kcal)
FR1	8.62 ^c ±0.42	31.87 ^c ±0.76	11.02 ^a ±0.12	1.55 ^{ab} ±0.03	3.57 ^c ±0.14	43.25 ^c ±0.35	399.75 ^b ±0.41
FR2	7.67 ^b ±0.05	36.78 ^e ±0.28	13.05 ^d ±0.05	1.42 ^a ±0.04	2.05 ^a ±0.03	39.02 ^b ±0.30	419.77 ^c ±1.44
FR3	7.75 ^b ±0.03	29.81 ^b ±0.08	12.15 ^{bc} ±0.06	3.24 ^c ±0.07	5.11 ^e ±0.24	41.97 ^c ±0.20	396.47 ^b ±0.94
FR4	8.35 ^c ±0.03	27.69 ^a ±0.08	12.02 ^{bc} ±0.07	2.82 ^d ±0.02	4.17 ^d ±0.26	44.94 ^d ±0.23	398.73 ^b ±0.33
FR5	7.42 ^a ±0.12	35.03 ^d ±0.84	11.79 ^b ±0.28	1.78 ^{bc} ±0.02	2.77 ^b ±0.24	31.27 ^a ±0.57	396.34 ^a ±0.39
FR6	8.36 ^c ±0.06	27.83 ^a ±1.15	12.44 ^c ±0.21	2.02 ^c ±0.03	3.05 ^{bc} ±0.06	43.21 ^c ±0.99	397.16 ^b ±0.59

Values are means ±SD of three determinations. Means in the same column with different superscripts are significantly different (P < 0.05)

DISCUSSION

Moisture contents of the fish roll snacks which differed significantly, varied from 7.42-8.62g/ 100g (P < 0.05). These values, which are lower than those reported for fish roll samples by (Pikuda and Ilelaboye, 2009) (11.49-13.96g/100g), are highly desirable as they enhance the shelf lives and the keeping quality of the snacks. The differences in the moisture content of the food snacks could be due to preparation methods of the snacks. It could also be due to the rate of evaporation during oven drying in the course of the treatment of the experimental samples.

Lipids are a concentrated source of energy, highly useful in increasing density of diet. This is particularly important for young children who have limited gastric capacity. Apart from being a concentrated source of energy, fats and oils also provide essential fatty acids necessary for the proper functioning of the human blood, but too much of them may lead to health problems such as obesity, high blood pressure and heart disease

(SAN, 2003). The crude lipid contents of the fish roll samples (11.02-13.05g/100g) which varied significantly (P < 0.05), could be attributed to varying amounts of butter (an ingredient) used in the processing method and draining time of fried food snack after frying.

The fats (butter) and oils used in the preparation of the fish based snacks are usually rich in saturated fats, which makes the quality of the lipids in the fish snacks quite unhealthy. Eating good fats such as monounsaturated and polyunsaturated fats in place of saturated fats lowers the “bad” LDL cholesterol, and it improves the ratio of total cholesterol to the “good” HDL cholesterol, lowering the risk of heart disease. Eating good fats in place of saturated ones can also help prevent insulin resistance, a precursor to diabetes (Riserus et al., 2009). Also in terms of quantity, the lipid/fat content of the food snacks (11.02-13.05g/100g) is lower than the daily recommended allowance value of lipid which is 65g/day.

The ash content of a food gives an idea about the inorganic content of the food from

where the mineral content could be obtained. Samples with high ash content are expected to have high concentrations of mineral elements, which are expected to speed up metabolic processes and improve growth and development. There were slight variations in the ash content (1.42-3.24g/100g) of the fish roll snacks ($P < 0.05$). This might have been due to the diverse types of fish used in the food snacks since fishes are good sources of minerals.

The fish roll samples had crude fiber contents, ranging from 2.05-5.11g/100g. The values, though low, are a bit higher than those reported by Pikuda and Ilelaboye (2009) (0.14–0.24g/100g). Good fiber content is advantageous to adults with colon diseases, while it also prevents constipation (Olusanya, 1991). According to FAO (1988), increased fiber consumption may contribute to a reduction of incidence of certain diseases, including diabetes, coronary heart disease, colon cancer and various digestive disorders; it also absorbs water thus producing soft and bulky stools. Hence the consumption of food snacks low in fibers such as fish roll and puff puff could lead to constipation and heartburn, even as frequent eating of such snacks promotes obesity (SAN, 2003).

The crude fiber content of the fish snacks which differed significantly from one another ($P < 0.05$) could be attributed to use of different types of wheat flour used as an ingredient in the preparation of the fish rolls. The crude fiber content of the fish snacks in this study (2.05-5.11g /100g /100g), is lower than the Recommended dietary allowance (RDA) of 16g/day for adults (RDA, 1989), hence consumption of any of these snacks alone will be grossly inadequate to meet the significant role of fiber in human diet for the reduction of incidence of certain diseases, including diabetes, coronary heart disease, colon cancer and various digestive disorders. Carbohydrate constitutes the most important Kolade, 2015

source of food energy, comprising of some 40–80% of total food energy intake for both metabolic and physiological functions of the body (Olusanya, 1991). The carbohydrate contents which varied significantly ($P < 0.05$), ranged from 31.27 -44.94g/kg. These values are a bit lower than those reported by Pikuda and Ilelaboye (2009) for fish rolls (48.07-52.21g/100g). Since wheat flour was a major ingredient used to make fish rolls, hence the high levels of carbohydrate content in the food snacks.

The carbohydrate content of the fish rolls (31.27 - 44.94g/kg) would be inadequate to meet the body's daily requirement for energy since the values obtained are lower than the recommended dietary allowance (RDA) of 300g/day as shown in Table 1.

The values of protein content of the fish rolls obtained in this experiment (28.64-36.78 g/100g) are higher than those reported by Pikuda and Ilelaboye (2009) (16.80-18.83 g/100g). These food snacks are rich in protein, because one of their main ingredients is fish, which is a good source of protein. These protein values which varied significantly ($P < 0.05$), could be attributed to different types of fish used for the fish snacks which were procured from different locations.. The processing method of drying during the treatment of the food snacks could have contributed to these variations.

The amount of protein (28.64-36.78 g/100g) derived from these snacks analyzed, is lower than the recommended dietary allowance (RDA) value for protein of 50g/day as shown in Table 1, hence consumption of any of these snacks alone will be grossly inadequate to meet the significant role of protein in human diet in controlling growth and cell differentiation.

The energy needs of an individual, is the amount of food energy required to compensate for energy expenditure when the size, body composition and level of physical activity are

compatible with a lasting state of good health and the maintenance of physical activity, that is economically necessary and socially desirable (Bello *et al.*, 2008).The chief sources of energy in the human body are lipids and carbohydrate.

Using Atwater factor of 4, 9 and 4 (Osborne and Voogt 1978) the fish roll samples in this study, had the energy content ranging from 396.34 - 419.77 kcal, which is a bit similar to those reported by Pikuda and Ilelaboye (2009) [(403.60–415.19kcal)] .The energy values of the fish snacks in this study had significant differences which could be

attributed to the varying protein and lipid contents of the snacks.

None of the sampled fish roll snacks had adequate energy content value required daily by humans. The energy contents of the fish snacks were much lower than the recommended dietary allowance (RDA) value of an average adult which is 2700 kcal for male and 2100 kcal for female as shown in Table 1. Thanks to the fact that other foods are available to compensate for the deficiencies. Thus, there is the need to be less dependent upon this fish based food snack as a wholesome meal, but to take more of foods that supply balance diets since they do not adequately supply daily required nutrients.

Table 2: Recommended Dietary Allowances For Adults And Children Of 4 or More Years Of Age.

Parameter	Recommended Dietary Allowance (RDA) ¹
Energy	2100kcal/day(for women) 2700kcal/day(for men)
Total Carbohydrate	300g/day
Protein	50g/day
Total Fat	65g/day
Fiber	25g/day

Recommended Dietary Allowances (1989)

CONCLUSION

The results of the study shows that the food snacks contain good amounts of protein, lipid, ash, with high energy contents, yet they are inadequate to meet the recommended dietary allowance. Based on the results of the analyses on the food snacks, one may be tempted to recommend their regular consumption, but according to the Swiss Association for Nutrition (SAN) 2003, that the frequent and prolonged consumption of fat rich snacks promotes obesity. Thus, these snack food are considered unhealthy and it is recommended that their consumption be limited, mainly as part of an effort to control body weight and also to avoid the consumption of saturated and trans fats. It is also necessary to avoid being addicted to these snacks, this being directed more to the middle class, the youths and the children who are the major customers, as they are unhealthy and much consumption of such snacks may be detrimental to human health

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