International Journal of Pharmaceutical Research and Applications
Volume 6, Issue 4July-Aug 2021, pp: 157-162www.ijprajournal.com ISSN: 2249-7781

Proximate and mineral constituents of some meals sold around LadokeAkintolaUniversity of Technology (LAUTECH) Ogbomoso, Oyo State, Nigeria.

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Date of Submission: 25-06-2021 Date of Acceptance: 07-07-2021

ABSTRACT

The patronage of eateries around LadokeAkintola University of Technology (LAUTECH) has been on the increase among staff and students due to the busy schedule and length of time spent daily on campus, thus the nutrient qualities of the foods need to be investigated. Some meals like eba, fufu, amala, pounded yam with varied proportions of soup bought in both modern and local eate(ries were evaluated for few nutrient constituents using standard methods. Proximate analysis showed that nutrient contents varied extensively. Ash (0.57- 1.70g/100g); Crude fat (4.48-18.55g/100g); Protein (12.25-17.88g/100g); Crude fibre (1.84-10.86g/100g) and Carbohydrate (33.73-53.43g/100g) were reported on dry weight basis. The meals contained nutritive mineral elements in the order Cu< Fe< Zn<K<Mg<Ca<Na. The meals could provide health benefitting mineral elements but there should be regulations on the use of salt and excess vegetable oil by the food vendors.

Keywords: meals, mineral elements, health benefits, LAUTECH.

I. INTRODUCTION

Lifestyle changes that have taken place in many countries worldwide, over the last few decades have an impact on food consumption patterns. One of the most prominent trends is the increase in consumption of non-homemade foods (Jaworowskaet al.,2013). Major factors impacting these changes include separate living of couples, busy work schedules of women and accessibility of restaurants cooking different meals for commercial purposes. Most times, ready to eat or cook products are convenient to eat rather than having to spend time preparing food for the whole family. Consumers have recognized that over-reliance on one single food or food group will not provide the range of nutrients required for optimum health and well-being (Mcevoy et al.,2012), thus relying on these outlets which can prepare many of these food items within the shortest period.

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LadokeAkintola University of Technology (LAUTECH) is a tertiary Institution located at Ogbomoso North Local Government, Ogbomoso, Oyo State, Nigeria with geographical coordinate 8° 8' 0" North, 4° 16' 0" East. The main entrance is located along the Old Ogbomosho-Ilorin road while the other entrance is at Under G area of the city. The University that began its first academic session on October 19, 1990 with a total of four hundred and thirty six candidates now enrolled about thirty thousand students and more than three thousand staff (Wikipedia, 2019).

In a survey that was reported on the assessment of some fast foods prepared in selected eateries around LAUTECH, Ogbomoso, 33.3 % of respondents regularly patronized the eateries at least twice weekly (Bello et al., 2011). The study focused and reported on the nutrients found in these meals, including fried rice, chicken and meat pie. These categories of foods are becoming more expensive and unaffordable by many. Apart from the cost, consumption of fast food has been linked to obesity and overweight status (Atkins and Davies, 2000; Pereira et al., 2005), and those who eat it had substantially higher calories, higher saturated and total fat, higher carbohydrates, and higher added sugar and protein intake than their non-fast food consuming counterparts.

In addition, those that ate in restaurants had a higher body mass index (BMI) than those who ate home cooked foods (Ebeling et al., 2002; Nielsen andPopkin, 2003). Most times, the fast food/eat out products are nutritionally affected due to some additives like salts, seasonings, spices and condiments added during food preparation. Addition of additives to cooked vegetables has been implicated in loss of most minerals that are essential to healthy living (Bwembya et al., 2018). However, most consumers are careless about the nutrients in ready to eat foods if they are tasty, easily accessible and affordable. Many students and staff are patronizing the eateries for consumption of foods like “Eba”, “Fufu”, “Amala”, “Pounded yam” with different stews because of assumed lower cost and satiety not minding the health implications.

Thus, this study investigated the level of some nutrients in some meals consumed by students and staff in commonly patronized eateries around LAUTECH, Ogbomoso.

II. MATERIALS AND METHODS

1.1. Selection of eatery

The selection was based on the information on level of patronage by staff and students. Two types of eateries were selected based on the types of foods they serve. The eatery that serves some conventional fast foods like pastries, fried rice, jollof rice and chicken alongside some local meals was tagged as modern eatery while the one that serve only local meals was tagged as local eatery. From the information received, two (2) eateries were systematically selected based on their patronage level by the staff and students of the institution.

1.2. Collection and preparation of samples

A plate of each meal was bought at the two selected eateries, kept in sealed food containers and transported in sterile polythene bags to the laboratory within thirty minutes. The food samples were labeled as SDM_1 and SDM_2 (Semolina); FVM_1 and FVM_2 (Fufu); ADM_1 and ADM_2 (Amala); $PVM_1$and PVM_2 (pounded yam); EDM_1 and EDM_2 (Eba)Subscript 1 and 2 means modern eatery and local eatery respectively. Each plate contained unequal proportion of soup (vegetable and meat). Each of the samples was separately homogenized using a KW 10 food blender, and weighed for different analyses.

2.3. Analytical procedures

Moisture content, ash content, crude fiber, crude protein, fat content and carbohydrate were determined by the method of official Analytical Chemists (AOAC, 2005). Mineral elements were quantified after wet digestion with nitric acid (HNO_3) using Buck Scientific Model 210 VGP (American specification) Atomic Absorption Spectrophotometer.

2.4. Statistical analysis

Analyses were carried out in triplicate on the samples obtained from each eatery and the result presented as mean and standard deviation of all determinations.

III. RESULTS AND DISCUSSION

The proximate compositions of the different foods bought from the two selected eateries around LAUTECH were presented in Table 1. The moisture content ranged between 76.15 and 80.60g/100g. The moisture content is an indication of the biodegradability of food substances. Microbial growth and reduction in the shelf-life of foods are the consequences of high moisture content

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(OladimejiandBello, 2011). Thus, the meals might not have high shell-life.

Ash value ranged from 0.57 to 1.70 %. Ash content is an indication of the level of inorganic matter present in the food matrix. The values compared favourably with a range of 1.3 to 3.8 % reported for some foods from a Nigerian eatery (OtemuyiwaandAdewusi, 2014).

The fat contents of the foods ranged from 4.48 to 18.55 %. High-fat content of foods might lead to a high intake of unhealthy fats by the consumers. Individual cannot control the level of oil consumption when patronize these eateries. This might consequently lead to obesity and heart problems. The meals are carbohydrate-dense foods but the stews with which they are served are the ones responsible for the recorded fat contents. Most times, different types of oil with varying compositions are used for cooking, and most times they undergo deep frying when in use for making stew.

Protein content of the meals ranged from 12.92 to 17.88 % with the highest value reported for Semolina meal and lowest for 'Eba'. It was earlier reported that foods that provide more than 12% of their calorific value of protein are good sources of protein (FNB, 2001; Bello et al., 2011). The meals could be a good source of protein.

Crude fibre serves as an anti-constipation ingredient, thus, increases the digestibility of foods in the stomach. Meals that are low in crude fibre are likely to be supplemented with food items that are rich in fibre. EDM_2 and EDM_1 have the highest crude fibre content of 10.86 and 8.69% respectively while the least values in SDM_2 and SDM_1 were 1.84 and 2.66% respectively. Increased intake of fibre rich meals have been associated with lowering of blood lipids, improved glycemic index and increasing hyper-insulemnia. It is recommended that individuals should consume more vegetables along with low fibre meals to prevent constipation associated with irritable bowel syndrome and possible cancer of the colon. Also, the high level of carbohydrates in the meal could provide the much needed energy to staff and students consuming it. This indicates that it can complement some other diets to supply the nutrients needed by the body.

The levels of some nutritive elements in the meals were reported in Table 2. Calcium (Ca) helps in building normal bones, teeth and cell wall formation but its absence may result in weak and stunted growth because of poor bone development. Although the meals were homogenized together with the soup and meats, low values of calcium ranging from 0.14 to 0.46 g/100g were reported. It is therefore recommended that individuals should be consuming other food source like soft bones from fish and meat to complement the level of calcium consumption in meals.

Sodium, potassium and magnesium are the major constituents of the common salt added to foods during cooking. The major dietary source of sodium is sodium chloride (NaCl, table salt); which is the world's most common food additive. Most people find its taste innately appealing, the use of table salts tends to enhance other flavors, probably by suppressing the bitter taste. Studies on the sodium content of foods show that as much as 75% of it is added during processing and manufacturing, 15% comes from salt added during cooking and at the table, and only 10% is naturally present in the food (Stoker, 2007). The high level of sodium in the meals (0.72 -1.13 g/100g) is an indicator of discretionary salt content utilized in the recipe and also a high amount of salt in the seasonings used in cooking.

The level of sodium in the different ethnic meals studied compared favorably with 278-672 mg/100g (in a baseline study from 2010-2013); 176-432mg/100g sodium (2017 label) in grain based mixed dishes, 778 -1250 mg/100g (baseline study from 2010-2013); 750-1219 mg/100g (2017 label study) in condiments and sauces while the levels of sodium in meat and poultry mixed dishes were 342 – 486 mg/100g (in 2010-2013 report) against 375 – 470 mg/100g (in 2017 label) (Ahuja et al., 2019). The survey showed that some progress was made in sodium reduction of some food items in the market place but sodium content for many highly consumed foods continued to be high and variable.

Strategies to reduce sodium content of many foods have been considered to be a cost effective public health strategy because high sodium intake has been linked to increased chronic disease risk, especially cardiovascular diseases (Stallings et al., 2019). It is not sure if local eateries around LAUTECH, Ogbomoso have any directory guidelines to be followed on the use of sodium salts in food preparations. It is thus advised that individual pays attention to what is eating. It is not out of place if LAUTECH public health officials also monitor and

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advise for regulation of various additives by the food vendors.

Magnesium (Mg) is used in bone formation, and muscle and nerve function. Highest level of magnesium was observed in the pounded yam meal, followed closely by 'Eba' meal and then 'Semolina' meal with the lowest value reported in 'Fufu' meal. Although, it was earlier reported that best sources of dietary magnesium include whole grains, spices and vegetables (USDA, 2012). High level of magnesium in the meal is actually from the combination of the soup and the carbohydrate rich meals. The recommended daily allowance, (RDA) of Mg is 400mg/day for healthy adult males and 320mg/day for healthy adult females (IOM, 1997). Consumption of any of these meals once per day will supply the RDA of Mg, and could prevent early and moderate symptoms of Mg deficiency such as loss of appetite, nausea, numbness, rapid heartbeat, hallucinations and weakness (Geiger andWanner, 2012).

The meals have higher content of iron 115 to 185mg/kg. Iron is a component of haemoglobin and helps in oxygen transport; hence, it is important for human nutrition and health. The recommended daily allowance of Iron was reported to be 10mg for male and 15mg for female (OtemuyiwaandAdewusi, 2014). Each portion of the meal will provide the RDA provided that there is maximum bioavailability of the iron. Adequate intake of Iron has been implicated to promote the production of red blood cells. Thus, the consumption of these meals could reduce the incidence of anaemic conditions. Rich sources of dietary iron have been reported to include red meat, liver, poultry, fish, seafood and leafy vegetables among others. However, iron in meat was found to be more easily absorbed than iron in vegetables (Roger, 2011). The composite meals have high content of iron which might be from the meat and vegetables (Al-Fartusie, andMohssan, 2017).

Zinc ranged from 0.16g/100g to 0.56g/100g in the meal. Zinc plays important role in the metabolism of protein, carbohydrates and lipids. It is vital for healthy working of many of the body systems, healthy skin, immune system and resistance to infection. Its deficiency was ranked as the 5th leading risk factor in causing diarrhea and pneumonia in children. Early Zinc deficiency could lead to impaired cognitive function, memory impairment and behavioural problems (Lassi et al., 2010). It was reported that even in severe cases, Zinc deficiency could cause hair loss, delayed sexual maturation and healing of wounds and also taste abnormalities (Prasid, 2004; MaretmandSardstead, 2006). Thus, these meals can complement other sources of Zinc to prevent these deficiencies problems.

Copper was detected in all the meal samples. The RDA for Copper in normal healthy adults was reported to be 2mg/day. A meal serve of any of the foods could provide the RDA provided maximum bioavailability of this trace metal. Copper is a micronutrient necessary for haematological and neurologic systems, enhancement of bone formation, formation of myelin sheaths in the nervous systems and assists in the absorption of iron from the gastrointestinal tract. Copper deficiency is rare among healthy people but may occur among infants with symptoms such as fatigue, anaemic and a decreased number of white blood cells (Jeremias et al., 2006).

IV. CONCLUSIONS

Levels of some nutrient constituents of some meals commonly consumed around LAUTECH by students and staff have been reported in this study. Noticeable nutrient variations in the meals were not observed among the two types of eateries studied. The serving proportions of these stews were not fixed and consistent in the different meals, so it cannot be concluded that the 'local' is better than the 'modern' in terms of the food served. The study was however with some limitations, the sampling coverage was limited to the meals prepared in a day, another limitation is that authors did not have control over the different constituents of serving size of stews even though were of the same amount of money. The carbohydrate dense meals are usually obtained from different sources, so the data obtained might not necessarily represent the meal at all time.

However, some of the meals can provide the RDA of some of the trace metals provided maximum bioavailability but, the use of salt, condiments and excessive serve of vegetable oil per meal should be regulated. The data represented an overview of the nutrient constituent of the meals sold around LAUTECH which is of public health concern.

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Volume 6, Issue 4July-Aug 2021, pp: 157-162www.ijprajournal.com ISSN: 2249-7781

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Table 1

Proximate constituents of nutrients in the meals (g/100g) dry weight

Sampl	*Moisture	Dry	Ash	Crude fat	Crude	Crude Fibre	Carbohydrat

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e		Matter			protein		e
SDM_1	79.02± 0.73	20.98± 0.73	1.24 ± **0.01**	4.48±0.11	17.21±0.93	2.66±0.49	53.43± 2.17
SDM_2	80.60 ±0.49	19.40± 0.49	1.26 ± 0.02	8.15±0.21	17.88±1.24	1.84±0.23	51.47± 2.19
FVM_1	77.80± 0.21	22.23± 0.21	0.57 ± 0.00	17.75±1.06	17.43±0.61	3.89±0.95	38.13 ± 2.23
FVM_2	77.70 ±0.73	22.30± 0.73	0.61± 0.00	14.90±0.14	17.43±3.13	5.59±0.59	39.17 ± 4.59
ADM_1	78.00± 0.59	22.00± 0.59	1.34 ± 0.03	11.42±2.00	12.92±0.67	4.35±1.24	47.97± 4.53
ADM_2	76.15 ±0.23	23.85± 0.23	1.42 ± 0.01	9.87±0.05	15.11±0.00	7.26±2.90	42.49 ± 3.19
PVM_1	78.80 ±0.66	21.20± 0.66	1.69±0.00	8.22±0.16	15.65±0.60	3.70±0.99	49.54 ± 2.41
PVM_2	79.21 ±0.46	20.79± 0.46	1.70±0.00	8.09±0.13	14.65±0.75	2.78±0.30	51.99 ± 1.64
EDM_1	77.20 ±0.16	22.80± 0.16	1.53±0.03	13.27±0.38	12.25±0.35	8.69±0.69	41.46± 1.61
EDM_2	77.70 ±0.25	22.30± 0.25	1.59±0.02	18.55±0.78	12.97±0.60	10.86±0.20	33.73± 1.85

Table 2

Level of some nutritive elements in the meals

Minerals	SEM_1	SEM_2	FVM_1	FVM_2	ADM_1	ADM_2	PVM_1	PVM_2
Ca g/100g	0.46 ± 0.05	0.33 ± 0.00	0.61 ± 0.01	0.14 ± 0.02	0.45 ± 0.01	0.36 ± 0.04	0.34 ± 0.06	0.44 ± 0.03
Na g/100g	0.78 ± 0.03	0.91 ± 0.02	0.80 ± 0.02	0.98 ± 0.04	0.73 ± 0.03	1.13 ± 0.01	0.72 ± 0.06	0.73 ± 0.02
K g/100g	0.03 ± 0.00	0.32 ± 0.10	0.41 ± 0.08	0.41 ± 0.01	0.45 ± 0.07	0.74 ± 0.06	0.65 ± 0.07	0.66 ± 0.08
Mg (mg/kg)	2000.50 ± 0.71	2090± 21.21	1776.50±2.12	1903.50± 30.41	1811.00± 55.15	2404.00±41.01	2660.00±21.21	2150.00± 70.00
Cu (mg/kg)	1.50 ± 0.71	2.50 ± 0.71	1.25 ± 0.35	2.25 ± 0.35	1.75 ± 0.35	2.81 ± 0.98	5.50 ± 0.71	3.75 ± 0.35
Fe (mg/kg)	115.00 ± 3.54	143 ± 7.07	138.25 ± 4.60	121.05 ± 2.12	136.00 ± 1.41	220.75 ± 0.35	170.50 ± 0.71	135.50 ± 2.83
Zn (mg/kg)	38.00 ± 0.71	56.15 ± 1.91	16.00 ± 1.41	20.81 ± 0.98	33.10 ± 1.27	43.75 ± 0.35	40.50 ± 2.83	31.75 ± 1.06