Original Research Article

Nutritional composition, microbial load of some pre-packaged snacks and safety compliance of informal foodservice operators in Oyo State

Abstract

Determination of the nutritional composition, microbial load, and observation of Food Health Inspector (FHI) on activities of the informal foodservice operators in some selected Local Government Areas (LGAs) in Oyo State with the view to ensure wholesome foods are sold within the study area. Proximate composition and microbial loads of some pre-packaged snacks bought from some informal foodservice operators were determined to confirm the compliance of the food with the recommended SON values. Questionnaire was administered to elicit information from food health inspector on the activities of the FSO in order to ensure wholesome foods were served. The pre-packaged foods analysed in this study showed that all the pre-packaged foods contained nutrients that is above the recommended SON value. Also, the microbial load of the pre-packaged foods after three days of incubation was lower than that of the recommended SON value. The response from the food health inspectors showed that the informal foodservice operators was not conforming with the safety methods of storage and preservation of the pre-packaged food. It can be concluded that, training of the informal foodservice operator is required to reduce incidence of food poisoning and ensure that wholesome foods are served in the study area. Also, strict sanction must be put in place for the informal foodservice operators who do not comply with set rules and regulations to ensure safe pre-packaged foods are sold in Oyo State.

Keywords: Proximate composition, pre-packaged foods, Food Health inspectors, microbial load

1.0 Introduction

Food is described as any substance and/or product that can be eaten or drunk by people and/or animals. It is required to maintain and increases standard of living or is used as nutrition or medical supplement (Savov and Kouzmanov, 2009; Hardy, *et al*., 2022). The consumers' safety is among the primary issues to be considered in food supply chain management.

After the rapid development of many economies, quality standards, imposed on food industry, are getting much more focused on consumers' rising and persistent demand for safe food and better quality of food and beverage. Consumers' expectations and perceptions (taste, aroma, freshness, and appearance) are getting more important on a daily basis (Savov and Kouzmanov, 2009).

The quality of product sold is one of the most important elements for every business that offers goods and/or services. Quality concept within the foodservice industry puts an importance on three key factors namely:

i. intended purpose of product conformity;

ii. product safety;

iii. consumer's expectations and perceptions (Spreng and Page,2001).

The changes in world demography have led to an estimate of about 2.5 billion people all over the world to consume food out of their homes on a daily basis, which may be because it is either assesible or convenient, (Fellows and Hilmi, 2018). This has led to increase in the consumption of pre-packaged food on a daily basis. (Akanji *et al.*, 2016) stated that 95% of working-class Nigerians in urban settings eat outside their homes and are therefore vulnerable to danger attributed to poor quality meal. Ezirigwe, (2018) reported that there are over two million reported cases of food poisoning annually throughout the world with estimated deaths of two hundred thousand people in Nigeria alone which includes children.

Safe food is now recognized as one of the essential human rights due to its ability to promote good health and increase productivity for poverty reduction as the number three Sustainable Development Goal 2030 that is good health and well-being (De Neve and Sachs, 2020).

Examples of such pre-packaged food are biscuits, chin chin, doughnuts, *Akara* Ogbomosho, and *Dodo* Ikire. These type foods have been implicated in the prevalence of diet related non-communicable diseases such as chronic heart diseases, high blood pressure, diabetes that are directly associated with obesity (Olatona *et al*., 2020; Taiwo et al., 2021). Food labels have been adopted by several countries as a means of measuring and ensuring food quality and safety (Kasapila and Shawa, 2011). About 70% of deaths worldwide are attributable to non-communicable diseases (NCDS) and the cases are on the rise daily especially in developing

countries like Nigeria and high consumption of prepackaged food has been implicated as part of the cause (Olatona *et al*., 2020).

Monosodium glutamate is an excellent example of a flavour enhancer that exists naturally in proteinous meals as an amino acid called glutamate, but only as free glutamate; in salt form with sodium or potassium, it is useful in improving the flavour of foods (Andarwulan *et al*., 2011; Otemuyiwa and Adewusi, 2013). Despite the nutritional composition of the snacks being printed on their labels, most customers are unaware of their nutritional content.

This study is aimed at determining the nutritional composition and microbial load of some selected prepackaged foods from some local government area (Oluyole, Ogbomosho, Northwest, Atiba, Kajola and Ibarapa LGA) in Oyo State, Nigeria with scores given the retailers by Food health inspectors in relation to safety of the pre-packaged.

2.0 Materials and Methods

2.1 The study area

The study area is Oyo state, Nigeria. Oyo State is located within the southwest geopolitical zone of Nigeria alongside Ekiti, Lagos, Ogun, Ondo and Osun states. Oyo State is situated 703.6 kilometres south-west of Abuja, Nigeria's capital city, and 232.7 kilometres south of Lagos, Nigeria's commercial capital. Oyo State is the largest state by population in Nigeria's south-west geopolitical region, with a total area of 28,454 km^2. Kwara State borders the state on the north, Osun State on the east, Ogun State on the south, and the Republic of Benin on the west. (See Fig 1 below for the map of Oyo state) and specific local government areas to be studied are indicated in Table 1.

Table 1: Study Area

Senatorial district	LGA Urban Area	LGA Rural Area
Oyo Central	Oluyole	Atiba
Oyo North	Ogbomoso south	Kajola
Oyo South	Ibadan northeast	Ibarapa

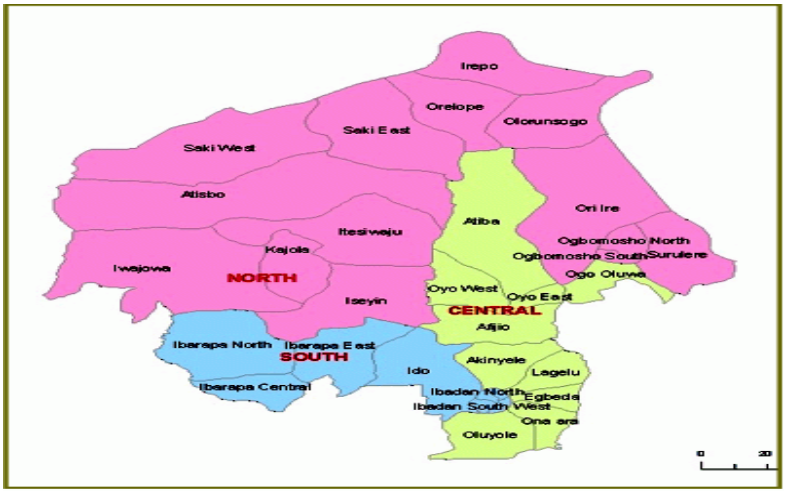

Figure. 1 Map of Oyo State

Source: https://www.google.com/educeleb.com assessed July, 2020

2.2 Sampling Procedures

Sample of 3 types pre-packaged foods each e.g., biscuit, coconut chips, a*kara* Ogbomoso, *dodo ikire* amongst others sold by the mobile and semi-mobile foodservice operators were selected for proximate and microbial analysis from the six selected LGA in the study area as shown in Table 2. These samples were selected because they expose their product to dust, and may not exhaust the product daily and there is no form of preservation.

LGA	Pre-packaged food
Oluyole	*Dodo* Ikire Coconut chips Phocus crunchy
Ogbomoso south	Chin chin, *akara* Ogbomoso Meatpie
Ibadan north east	*Dodo* ikire, Potato chips Sausage
Atiba	Cracker biscuit, Coconut chips Phocus crunchy
Kajola	Cracker biscuits, Chin chin Potato chips

Ibarapa	Cracker biscuits, Phocus crunchy Coconut chips

Table 2 Selected Pre-packaged Foods for Proximate and Microbial Analysis

2.3 Sample preparation

The pre-packaged snacks were weighed, dried in the oven (Gallenkamp Oven Model SA 9059 B) at 50°C, ground into powder and then sieved with No 72 mesh size (Griffin and George Ltd., London). The samples were stored in plastic containers with screw cap and kept in the freezer until use. Association of official analytical chemist (AOAC,2000) method was used to determine moisture content, total ash content, carbohydrate, crude protein, crude fats, and oil

2.4 Proximate analysis

Moisture, ash, crude fibre of the pre-packaged snacks was determined using AOAC, 2000. The Kjeldhal method of AOAC (2000) was used to determine the protein content of the sample. Fat content of the sample was determined using Soxhlet method. The percentage carbohydrate content was calculated by difference.

Carbohydrate content (%) =100%-(% moisture + % Ash + % crude protein + % crude fibre + % crude far)

2.5 Energy value

This was calculated by multiplying the values of crude protein, crude fat, and carbohydrate by factors of 4, 9 and 4, respectively. The sum of their product was expressed in kilocalories.

Energy value (Kcal)=(Carbohydrate×4)+ (Protein×4) +(Crude fat×9)

2.6 Microbial analysis

10 g of food sample was blended and homogenized in 90 mL sterile distilled water (10-1 dilution). Further tenfold serial dilution of the resultant homogenates was made to obtain 10^{-3} dilution respectively. From this dilution, aliquots of 0.1 mL were inoculated in replicate plates of different media using the spread plate technique (Adesetan *et al.*,2013). Nutrient agar (Oxoid) was inoculated for total aerobic count and Eosin Methylene Blue agar was used as a selective medium for the growth of the coliform bacteria to be incubated at 37°C for 24-72h. Colonies was counted at the end of the incubation period and expressed as Log CFU/g (Fawole, 1986).

2.7 Food health inspectors' evaluation of the informal food service operators' activities

Quantitative analysis was used to obtain information from the Food health Inspector on the activities of the Foodservice operators in the study areas. The questionnaire was used to elicit information on the quality of the prepackaged food sold, safety of the pre-packaged snacks, the hygienic practices of the operators and the availability of facilities to ensure safety.

2.8 Statistical analysis

All laboratory experiments were carried out in triplicates and results presented as mean and standard deviation of replicate analysis (N=3) of samples collected for each food type. ANOVA was used to assess and compare result and calculations made using IBM SPSS 20.0 for windows

3.0 Results and discussions

3.1 Proximate composition of the pre-packaged snacks

Table 3 shows the proximate composition results of some of the pre-packaged snack bought from the informal food service operators in some of the LGA in Oyo State. The crude protein values ranged between 1.4% and 15.1%. With coconut chips being the lowest and meat-pie being the highest, this may be due to addition of meat in the pre-packaged food. The protein content in *akara* Ogbomosho is 12.9% which may be due to the major ingredient in the preparation of the pre-packaged snack (Akara Ogbomosho). The SON (Standard Organisation of Nigeria) standard required a less than 5% crude protein content of which most the pre-packaged food samples exceed. Although potato chips have lower crude protein content when compared with the report of (Kolawole *et al*., 2020) who reported an increase in protein content of Potato chips made from orange flesh sweet potato.

The crude fat content ranged from 3.6% to 29.7 %. With *dodo Ikire* having the highest value and cracker biscuit having the lowest, also coco nut chips and *Akara Ogbomosho* also has a significantly high crude fat content 25.6% and 23.9% respectively, the high level of crude fat in *dodo Ikire* is due the amount of palm oil used to prepare the food this similar to the report of (Kayode *et al*., 2013) which suggested that it is a major source of cholesterol to the over ripe plantain could pose deleterious effect on susceptible person consuming foods containing high cholesterol. The fat and ash content of coconut chips reported by Manikantan (2016) was higher than the value reported in this study However, according to Sajilata *et al*., (2002) higher fat content within a certain limit makes digestibility difficult and causes rancidity in stored foods. The required standard should be between 10-25 of which *dodo Ikire* was the only product that exceed this standard.

The crude fibre content ranged between 0.3% and 6.8%, the lowest value being for *Akara Ogbomosho*, and the highest value was for cracker biscuit. Except for cracker biscuit and coconut chips other crude fibre content were significantly low when compared with the required standard for pre-packaged foods of less than 5%. It is known that fiber helps eliminate waste from the gastrointestinal tract because of its ability to bind water and thus soften the stool (Capuarno, 2017).

The ash content of the pre-packaged foods was between 0.5% and 5.2% with cracker biscuit and focus crunchy being highest and dodo Ikire being the lowest. The two biscuits with high total ash content may be due to deliberate attempt to increase its total ash content by adding some mineral during processing which is evident in the ingredient added. The total ash

content of dodo Ikire, coconut chips and potato chips were all significantly below the required standard of less than 3% for pre-packaged food, this worthy of note that they are not industrially packaged food. It has been reported that total ash content in food reduces with fermentation which may be due to usage of minerals by inherent microorganisms for metabolic activities (Osundahunsi and Aworh, 1998).

Carbohydrate content ranged from 51.0% (Akara Ogbomosho) to 75.2% for Chin chin. The carbohydrate content for Chin chin was significantly ($P<0.05$) higher than acceptable standard for CHO in pre-packaged foods of less than 50% while all the food sample were within the standard required.

Energy value ranged between 341.8 kcal/100g for cracker biscuit to 522.1 kcal/100g for dodo Ikire. The energy value for *dodo Ikire* was significantly higher than the required range allowed of 400 – 425kcal while the energy value for chin chin was significantly lower, this value may not be effective especially during illness such as diarrhoea. supplying adequate energy for children. According to Brown (1991), an energy density of 50 Kcal per gram of food can meet the energy need of children with three to four meals a day.

Generally, the proximate composition of all the food samples bought from the informal FSO and analysed have similar proximate values. This may be because they are industrially packaged product except product like Dodo Ikire, Akara Ogbomosho, Meat pie, Coconut chips, Chin chin and Sausage roll which are produced by informal FSO who are not registered with the government. Food products like Phocus Crunchy and cracker biscuit have been commercialized by big companies in Nigeria and they are distributed all over the country. This company utilized more technology in all aspect of the business and so have higher technological capability. The locally produced food has no information on their packaging except for the product name unlike the industrially packaged food that have name, address of manufacturer, nutritional fact, shelf life and batch number.

The producer of chin chin, *dodo Ikire*, *Akara Ogbomosho* are sole owner who lack capacity to invest in adequate technology need to ensure safety, this done at the detriment of the public and this fault cannot be traced to them.

Table 3.Proximate content of pre-packaged foods from different Informal FSO in the study area.

LGA	Moisture content w/w (%)	Crude protein w/w (%)	Crude fat w/w (%)	Ash content w/w (%)	Crude fibre w/w (%)	CHO w/w (%)	Energy (Kcal)
SON	6.0 max	5.0 min	1.0 max	2.0 max	0.03 max	50 min	400-425 min
			Cracker biscuit				
Atiba	7.2 ± 0.8[b]	11.2 ± 0.7[c]	3.6 ± 0.1[a]	4.2 ± 0.3[b]	5.2 ± 0.4[a]	68.6 ± 1.2[b]	351.6 ± 12 [b]
Kajola	8.3 ± 0.4[c]	9.8 ± 0.5[a]	4.2 ± 0.3[b]	5.2 ± 0.4[c]	6.3 ± 0.4[b]	66.2 ± 1.1[a]	341.8 ± 11 [a]
Ibarapa	5.0 ± 0.2[a]	10.2 ± 0.4[b]	4.4 ± 0.7[b]	3.5 ±0.2[a]	6.8 ± 0.4[b]	70.1 ± 0.8[b]	358.8± 8.5 [c]
			Dodo Ikire				
Oluyole	4.9± 0.2[a]	8.2 ± 0.9[a]	29.7 ± 0.1[b]	0.6 ± 0.1[a]	1.1 ± 0.2[a]	55.5 ± 2.4[a]	522.1 ± 23 [b]
Ibadan Northeast	4.7 ±0.2[a]	8.0 ±0.7[a]	27.8 ± 0.2[a]	0.5 ± 0.1[a]	1.0 ± 0.3[a]	58.0 ± 0.8[b]	515.1 ± 19 [a]
			Coconut chips				
Oluyole	3.3 ± 0.2[a]	1.4 ± 0.1[a]	25.6 ± 0.8[c]	1.1 ± 0.1[a]	6.2 ± 0.3[a]	62.5 ± 1.7[a]	486.0 ± 12.3 [c]
Atiba	3.1 ± 0.1[a]	1.5 ± 0.1[a]	22.7 ± 0.7[a]	1.3 ± 0.1[a]	6.0 ± 0.4[a]	65.4 ± 1.2[b]	471.9 ± 11 [a]
Ibarapa	3.5 ± 0.2[a]	1.6 ± 0.2[a]	23.6 ± 0.4[b]	1.3 ± 0.1[a]	6.4 ± 0.4[a]	63.6 ± 1.5[a]	473.2 ± 9.4 [b]
			Phocus crunchy				
Oluyole	4.5 ± 0.3[b]	5.2 ± 0.3[a]	14.1 ± 1.2[a]	4.9 ± 0.2[b]	2.1 ± 0.2[a]	69.3 ± 2.6[a]	424.9 ± 11.1[a]
Atiba	4.1 ± 0.2[a]	5.0 ± 0.4[a]	14.2 ± 0.1[a]	4.5 ± 0.1[a]	2.2 ± 0.1[a]	70.0 ± 1.6[b]	427.8 ± 9.0[b]
Ibarapa	4.6 ± 0.4[b]	5.5 ± 0.2[a]	15.2 ± 0.8[b]	5.1 ± 0.3[b]	2.0 ± 0.1[a]	67.6 ± 0.8[a]	429.2 ± 10.0[c]
			Chin chin				
Ogbomoso	8.9 ± 0.9[a]	10.2 ± 0.8[a]	2.8 ± 0.4[a]	2.0 ± 0.1[a]	0.8 ± 0.5[a]	74.8 ±3.4[a]	365.2 ± 5.5[a]
Kajola	8.7 ± 0.6[a]	10.4 ± 0.6[a]	2.6 ± 0.4[a]	2.2 ± 0.1[a]	0.9 ± 0.2[a]	75.2 ±2.2[a]	365.8 ± 5.6[a]
			Potato chips				
Ibadan Northeast	4.4 ± 0.1[a]	6.5 ± 0.4[a]	12.6 ± 0.5[a]	2. 7 ± 0.6[a]	3.2 ± 0.5[a]	70.6 ± 1.6[a]	421.8 ± 6.1[a]
Kajola	4.3 ± 0.2[a]	6.8 ± 0.6[a]	12.9 ± 1.1[a]	2.4 ± 0.5[a]	3.4 ± 0.6[a]	70.6 ± 1.6[a]	425.7 ± 5.8[b]
			Meat pie				
Ogbomoso	8.9 ± 0.3[a]	15.1 ± 0.8[a]	14.5 ± 0.6[a]	4.2 ± 0.5[a]	0.6 ± 0.1[a]	56.7 ± 0.8[a]	417.7 ± 4.8[a]
			Sausage				
Ibadan Northeast	5.7 ± 0.2[a]	9.6 ± 0.5[a]	13.6 ± 0.7[a]	3.6 ± 0.6[a]	0.4 ± 0.1[a]	67.1 ± 0.9[a]	429.2 ± 6.3[a]
			Akara Ogbomoso				
Ogbomoso	7.6 ± 0.4[a]	12.9 ± 0.4[a]	23.9 ± 0.5a	4.3 ± 0.4[a]	0.3 ± 0.1[a]	51.0 ± 0.7[a]	470.7 ± 9.1[a]

3.2 Total plate count of the pre-packaged snacks

The total plate counts results of the pre-packaged snacks bought from informal FSOs in six LGA in Oyo State are shown in Table 3. The microbial growth after 72 h was still below the recommended NIS standard for all the food samples. The total plate count for all the pre-packaged foods were insignificantly different from one another. The total plate count for Dodo Ikire from two different LGA (Oluyole and Ibadan Northeast) was significantly different throughout the period of the experiment with higher values (2.95×10^3 and 2.90×10^3 cfu/g) recorded after 72 h, this similar to the report of (Kayode *et al*., 2013) who attributed this to poor hygienic practice of the informal FSO. The total plate count of Coconut chips also increased with increase in days of incubation. The results were similar with highest values (4.01×10^3, 4.20×10^3 and 4.20×10^3 cfu/g) after 72 h of incubation. The microbial growth from Chin chin were 3.30×10^3 cfu/g (Oluyole LGA), 3.50×10^3 cfu/g (Atiba LGA) and 3.35×10^3 cfu/g (Ibarapa LGA). There was slightly difference in microbial growth in Chin chin and this may be due to different handling after processing and effects of packaging material on the product.

The total plate count of Phocus crunchy was among the highest in all the food samples bought from the informal FSO. The total plate count was 5.15×10^3 cfu/g (Ogbomoso LGA) and 5.30×10^3 cfu/g (Kajola LGA) after 72 h of incubation. The increase in the total plate count may be due to the fermentation process involved in the production of cracker biscuit. The total plate count of Potato chip was 1.20×10^1 cfu/g and 1.25×10^1 cfu/g (Ibadan Northeast and Kajola LGA) for the first 24 h. After 48 h of incubation, the total plate count of Potato chip increased to 2.30×10^2 cfu/g and 2.50×10^2 cfu/g. The 72h total plate count of Potato chip was 3.15×10^3 cfu/g and 3.20×10^3 cfu/g respectively.

Biscuits bought from the informal food operators have total plate count of 1.45×10^1, 2.70×10^2, and 3.10×10^3 cfu/g, (Atiba LGA), 1.50×10^1, 2.65×10^2, 3.00×10^3 cfu/g (Kajola LGA) and 1.45×10^1, 2.60×10^2, and 3.20×10^3 cfu/g (Ibarapa LGA) for 24, 48 and 72 h of incubation. The total plate count of Biscuit was similar in the three LGA sampled. Akara Ogbomoso has total plate count of 3.75×10^1, 4.70×10^2 and 5.80×10^3 cfu/g (Ogbomoso LGA) for 24, 48 and 72 h of incubation respectively. Meat pie has total plate count of 4.40×10^1, 4.40×10^2, 4.80×10^3 cfu/g (Ogbomoso LGA) for 24, 48 and 72 h of incubation. The total plate count of Meat pie was the highest for the first 24 h when compared to the rest of the samples, and there was a slight increase in the total plate count after 72 h. Sausage roll total plate count was 2.25×10^1, 2.55×10^2 and 3.70×10^3 cfu/g (Ibadan Northeast LGA) for 24, 48 and 72 h of incubation.

Table 4. Mean total plate count of pre-packaged foods from different Informal FSO in six LGA in Oyo state.

LGA	Day 0 (cfu/g)	Day 1 (cfu/g)	Day 2 (cfu/g)	Day 3 (cfu/g)
Cracker Biscuit				
Atiba	NG	$1.45^{a} \times 10^{1}$	$2.70^{a} \times 10^{2}$	$3.10^{a} \times 10^{3}$
Kajola	NG	$1.50^{a} \times 10^{1}$	$2.65^{a} \times 10^{2}$	$3.00^{a} \times 10^{3}$
Ibarapa	NG	$1.45^{a} \times 10^{1}$	$2.60^{a} \times 10^{2}$	$3.20^{a} \times 10^{3}$
Dodo Ikire				
Oluyole	NG	$1.30^{a} \times 10^{1}$	$1.90^{b} \times 10^{2}$	$2.95^{b} \times 10^{3}$
Ibadan Northeast	NG	$1.35^{b} \times 10^{1}$	$1.85^{a} \times 10^{2}$	$2.90^{a} \times 10^{3}$
Coconut Chips				
Oluyole	NG	$1.95^{b} \times 10^{1}$	$2.50^{b} \times 10^{2}$	$4.01^{a} \times 10^{3}$
Atiba	NG	$2.00^{b} \times 10^{1}$	$2.30^{a} \times 10^{1}$	$4.20^{a} \times 10^{3}$
Ibarapa	NG	$1.75^{a} \times 10^{1}$	$2.80^{b} \times 10^{2}$	$4.20^{a} \times 10^{3}$
Chin chin				
Oluyole	NG	$1.80^{a} \times 10^{1}$	$2.05^{a} \times 10^{2}$	$3.30^{a} \times 10^{3}$
Atiba	NG	$1.90^{b} \times 10^{4}$	$2.30^{a} \times 10^{2}$	$3.50^{b} \times 10^{3}$
Ibarapa	NG	$1.85^{b} \times 10^{1}$	$2.20^{a} \times 10^{2}$	$3.35^{a} \times 10^{3}$
Phocus Crunchy				
Ogbomoso	NG	$3.30^{a} \times 10^{1}$	$4.35^{a} \times 10^{2}$	$5.15^{a} \times 10^{3}$
Kajola	NG	$3.35^{a} \times 10^{1}$	$4.40^{a} \times 10^{2}$	$5.30^{a} \times 10^{3}$
Potato Chips				
Ibadan Northeast	NG	$1.20^{a} \times 10^{1}$	$2.30^{a} \times 10^{2}$	$3.15^{a} \times 10^{3}$
Kajola	NG	$1.25^{b} \times 10^{1}$	$2.50^{b} \times 10^{2}$	$3.20^{a} \times 10^{3}$
Meat pie				
Ogbomoso	NG	$4.40^{a} \times 10^{1}$	$4.40^{a} \times 10^{2}$	$4.80^{a} \times 10^{3}$
Sausage roll				
Ibadan Northeast	NG	$2.25^{a} \times 10^{1}$	$2.55^{a} \times 10^{3}$	$3.70^{a} \times 10^{3}$
***Akara* Ogbomoso**				
Ogbomoso	NG	$3.75^{a} \times 10^{1}$	$4.70^{a} \times 10^{2}$	$5.80^{a} \times 10^{3}$

NG- No growth. mean ± SD are from three different measurements. Values with different superscripts on the same row are significantly different at $p \leq 0.05$.

3.3 The activities of food health inspectors on the operation of the informal foodservice system.

The Table 4 report the activities of the food health inspector towards ensuring that wholesome food is produced by the FSO. The frequency of visit by the health inspector to the FSO was mainly on a quarterly basis (65.3 %) This may be due to lack of enough resources to increase their visit to the operation sites of the FSOs. About 23.1% of the health inspectors visited them monthly for inspection area although this is not the case for this operator who have a high attitude towards food hygiene practices this is similar to the report of (Osagbemi *et al*., 2010) that food handlers in Okene area have positive attitude towards food safety.

The food inspectors conducted workshop or training on food handling practices for the foodservice operator. About 55.5% did so quarterly, 25.9% did it yearly, while 18.5% did so monthly. This training workshop could enhance their knowledge food safety and hygienic practice in the foodservice system. About 70.4% of the food service operators had equipment such as freezer, warmers, glass, or mesh display to prevent food contamination.

About 25.9% of the health inspector's safety guides and standards for the inspection of the foodservice operators, 44.4% said they did not, while 29% were not aware of the standard. This implies that most of these inspectors did not have copies of this standard. The standard sanctions for defaulter as responded by the inspectors is permanent closure 18.5% and temporary (37%) closure of site of the food service system. About 37% impose fine while the remaining 18.5% used either of the options.

The amount of fine imposed on the foodservice operating in an unhygienic or wholesome environment vary from below N50,000 to above N100,000 showing that 51.9% was below N50,000, 22.2% was between N50,000 and N100,000 and the remaining 25.9% was above N100,000 this amount was paid into the government account of which receipt of payment was issued before the closed outlet is opened for continuation of operation.

From the table 5 below it was gathered that the mean rating for the quality of meal served by the operator was satisfactory to the health inspectors, and they also satisfied with the safety of meal served (1.9) the FHIs was also satisfied with the hygienic practice of the operators within the study area. The FHI were satisfied with availability of facilities to ensure safe quality meals are prepared. In the same vein, 42.3% and 23.1% of the sampled food inspectors were satisfied and also highly satisfied with the quality of the meal served.

In related form, trainers also need training, which is popularly refers to train the trainers program. The Table 5 below report the frequency of the training received by the food health inspectors. The outcome of the analysis shows that they train the food health inspectors yearly either as a refresher course and new training programme. Which is similar to what (Osagbemi *et al*.,2010) and (Pepple, 2017) suggested that both the operators and health inspectors require to be trained frequently in order to have a wholesome food being served in the community where they operated.

Description of Item	1	2	3	Mean
Quality of meal served by the FSO	7(26.9)	11(42.3)	8(30.8)	2.0
Safety of meal served	9(34.6)	11(42.3)	6(23.1)	1.9
Hygienic practices	13(50.0)	5(19.2)	8(30.8)	1.8
Availability of facilities to ensure safety	5(19.2)	13(50.0)	8(30.8)	2.1

Food health inspector's (FHIs) evaluation of the informal FSOs activities

Source: Author's survey, (2020)

1 -Not Satisfactory

2 -Satisfactory

3 -Highly Satisfactory

Conclusion

The nutritional composition and the microbial loads of all the pre-packaged snacks use in this study do not deviate from the SON (Standard Organisation of Nigeria) given standard. This means that in influence of informal foodservice operators is not affecting the quality of the pre-packaged foods. The report from the food health inspectors in the study area shows that the informal foodservice operators are not conforming to the rules and regulation guiding the sales of some of the pre-packaged snacks. Strict punishment must be put in place for any informal foodservice operators that deviate from the laydown rules and regulations.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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