

Original Research Article

Assessment of Food Safety Practices among Smoked Fish Sellers in Ekiti State, Nigeria

Abstract - This study was carried out to assess the food safety practices among the smoked fish sellers in Ekiti State, Nigeria. It aimed at describing the socio-economic characteristics of the smoked fish sellers; identifying the food safety practices, examining the determinants of using food safety practices, estimating the profitability of smoked fish and ascertaining the constraints to food safety practices among smoked fish sellers in the study area. Data, obtained through a multi-stage sampling technique, were analysed through the use of descriptive statistics and Tobit regression models. Result from socio-economic characteristics of the respondents revealed that smoked fish business was dominated by females (75.8%) who were majorly young people with the mean age of 45.5 years. The majority of the respondents were married (59.1%). It was also revealed that most of the respondents were literate with different levels of education with the average family size of 6 persons. The respondents were fairly experienced with 41.7% of them had more than 10 years of involvement in smoked fish enterprise. Most of the respondents used charcoal (53.4%) and half drum kiln (57.5%) in smoking their fish. A larger percentage (33.3%) of the respondents sourced their capital from other sources. Majority (61.7%) of the respondents smoked other species of fish such as hake fish and herring fish etc. The smoked fish sellers (68.3%) had prior knowledge of food safety practices while the respondents (57.5%) had access to useful food safety practices. The majority (73.3%) of the respondents had no access to bank loans. This study revealed that the majority of the smoked fish sellers were food safety compliant. It revealed that the major food safety practices used by the respondents were sweeping of their workspace before and after processing (99.2%) and washing of their hands before and after processing (97.5%) The only place they were lacking was in the covering of their smoked fish, the study revealed only few (32.5%) of the smoked fish sellers covers their smoked fish. On the cost and returns, the study revealed the mean value of total cost to be ₦305,690 and the mean amount of the total income generated by the respondents to be ₦495,850. The total income was greater than the total cost, which implies that the business was profitable. The results of Tobit regression model analysis revealed that age, level of education, family size and access to useful food safety practices were found to significantly influence the

number of food safety practices used by the respondents in the study area. On the constraints to the use of food safety practices, the study revealed that the respondents were facing different problems and the most prominent problem was the lack of storage facilities (88.3%).

Keywords- Food safety practices, smoked fish, Tobit regression analysis

1.0 Introduction

Foods are products derived from plants or animals that can be taken into the body to yield energy and nutrients for the maintenance of life and the growth and repair of tissues (Whitney and Rolfes, 2005). Safety is defined as setting standards for toxicological and microbiological hazards, and instituting procedures and practises to ensure that the standards are achieved (Food and Agricultural Organization (FAO, 2019)/ World Health Organization (WHO)). Food safety is therefore described as the handling, preparation and storage of food in ways that prevent food borne illness and it is also the assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use.

Unsafe food poses global health threats, endangering everyone. Infants, young children, pregnant women, the elderly and those with an underlying illness are particularly vulnerable. Every year 220 million children contract diarrhoea diseases and 96,000 died. Unsafe food creates a vicious cycle of diarrhoea and malnutrition, threatening the nutritional status of the most vulnerable. Food can become contaminated at any point of production and distribution, and the incidents are caused by foods improperly prepared or mishandled at home, in food service establishments or at markets. Not all food handlers and consumers understand the roles they must play, such as adopting basic hygienic practices when buying, selling and preparing food to protect their health and that of the wider community.

Fish is a primary source of animal protein; it provides protein and essential micronutrients required for the maintenance of a healthy body. A major goal for the food processing industries is to provide safe, wholesome and acceptable food to the consumers and the control of microorganisms is essential to meet these objectives. However, this can be very difficult as contamination of products in a food processing environment may take place in all stages, during production (both pre and post harvesting) and processing (Alberth *et al.* 2013). Most commonly reported food preparation practices that contribute to foodborne diseases includes; poor environmental hygiene, inadequate cooking, contaminated equipment, improper holding

temperatures and food from unsafe sources (Baluka *et al* 2015). Nkere *et al* (2011) stated that the bacteriology count in food prepared or water is a key factor in assessing the quality and safety of food and can reveal the level of hygiene

Fish requires a good preservation method to increase its shelf life for subsequent usage. There are various methods in which it can be preserved, smoking is one of them. This smoking method is an ancient method, it has been in existence since the time of our forefathers. This method is a cheap one and it's known for its efficiency. Smoked fishes are prepared from various species such as catfish, tuna, marine water jewfish, pomfret, mackerel, Indian salmon, eel, snakehead, prawn, herrings, hake fish etc.

Some reports have explained that the majority of smoked fishes in the market are not satisfactory for human consumption and consumers often give complaints on the quality. This is due to the fish sellers' poor sanitation practices, insufficient regulatory systems, inappropriate ambient temperature when preserving, lack of funds to spend on appropriate equipment, lack of storage facilities, illiteracy and weak food safety law amongst the sellers. Due to the recurrent food contamination incident, this research is aimed at assessing the food safety among smoked fish sellers in Ekiti State, in order to identify the cause of smoked fish contamination so that it can be suppressed or possibly eliminated.

2.0 Methodology

2.1 The study area

This study was carried out in Ekiti State. Ekiti State is in Southwest Nigeria, created on October 1st, 1996 alongside five other new States by military dictator General Sani Abacha. Ekiti was carved out of the former Ondo State. Ekiti State is located in the tropical climate of distinct wet and dry seasons. Geographically, it is located between longitude 4°45" and 5°45" East of the Greenwich meridian and latitude on 7°15" and 8°5" North of the equator (Owoeye, 2018). It shares boundaries with Kogi State in the North-east, Kwara State in the North and Osun State in the South and South-east. The State enjoys a tropical climate with two distinct seasons: rainy season (April to October) and dry season (November to March). The temperature ranges from 21°C to 28°C, with relatively high humidity. The population of the inhabitants of the State, according to a 2006 population census, was 2,737,186. The men are predominantly farmers while the women engage mainly in trading activities; for the educated indigenes who are

employed in the formal sector, farming remains their secondary occupation. Selling of smoked fish is a common economic activity among market women in Ekiti State, hence the importance of this research in the study area.

2.2 Data Collection

Data used for this study were gathered from primary source. The primary data collection was done with the aid of structured questionnaire using personal interviews. The questionnaire draws out information on the respondents' socio-economic characteristics such as age, gender, marital status, education, family size, occupation, experience, credit access, yield, fish source, insecticide usage, equipment used, monthly income, safety practises used by the smoked fish sellers, cost of food safety on smoked fish and the constraints to the use of food safety practises among smoked fish sellers. And it was complemented with an oral interview schedule.

2.3 Sampling Techniques

In this study, multi-stage sampling technique was used. At the first stage two Local Government Areas (LGAs) within Ekiti (Ado-Ekiti and Ikere-Ekiti LGAs) were selected purposively, based on the population of the smoked fish sellers in the LGAs. Second stage involved the random selection of six different locations in each of the selected LGAs because of their presumed relevance to the study. The third and the last stage involved random selection of 10 smoked fish sellers from each location. This gave a total of one hundred and twenty (120) respondents for the study.

2.4 Data Analysis

Data generated for this study were analysed, using descriptive statistics and Tobit regression model analysis

2.4. 1 Descriptive data analysis

The descriptive statistics involves the use of tabulation, frequency distribution and percentages. Descriptive statistics was carried on all variables of interest, including the respondents' social-economic characteristics, the safety practises among the respondents, the factors determining food safety practices used by the respondents, cost of food safety among smoked fish marketers and constraints to the use of food safety practices among the respondents.

2.4.2 Tobit regression model analysis

The Tobit regression model was used in this study because it measures both the probability of the use of food safety practices and the intensity of the use of food safety practices. It assumes that the use of food safety practices is continuous. It expressed the smoked fish seller's use of food safety as a function of linear combination of observable explanatory variables, some unknown parameters and an error term (ϵ_i). The major strength of this model over other econometric models was the inclusion of observations with non-use of food safety practices. Tobit regression model is presented as:

$$Y_i^* = \beta X_i + \mu_i$$

Mathematically expressed for i th smoked fish sellers, tobit model is explicitly expressed as:

$$Y_i^* = \beta_0 + \beta_1 X_1 + \dots + \beta_n X_n$$

$i = 1, \dots, n$

Where;

Y_i^* is the observed independent variable i.e the safety practices measured in the number of food safety practices to be used by individual smoked fish sellers divided by the number of probable safety practices used by the smoked fish sellers

β_0 is the intercept or the level of safety practices that will occur regardless of the independent variable

$\beta_1 \dots \beta_n$ are the coefficient of the independent variable

$X_1 \dots X_n$ are the independent variables (i.e age, marital status, sex, level of education, family size, occupation, years of experience in fish smoking, types of kiln used, access to useful food safety practices information etc.)

3.0 Results and Discussion

3.1 Socio-economic Characteristics of the Respondents

The result of socio-economic characteristics of the respondents revealed that the smoked fish sellers in the study area were relatively young as only 39.3% of the respondents were over 50 years. This is in agreement with the study conducted by Fapohunda, (2012) on economic analysis of smoked fish marketing in Owo Local Government, Ondo State, Nigeria who concluded that smoked fish marketing is dominated by young people. Also, the result further showed that 75.8% of the respondents interviewed were female, implying that smoked fish selling was dominated by

female in the study area. This is in consonance with the study of Odulate *et al.* (2011) who concluded that women were majorly involved in marketing of fish in the coastal wetland areas of Ogun State, Nigeria. All over Nigeria, most especially the southwestern region, women majorly process and market fish (Babalola *et al.*, 2015). The result further showed that 59.1% of the respondents were married. This report agrees with the findings of Iliyasu *et al.*, (2012) and Chaston, (2011) who concluded that the majority (65%) of the smoked fish marketers were married, 30% of the smoked fish marketers were single, while the divorced and widowed smoked fish marketers were 3.33% and 1.67% respectively. From the result, it was further reported that 50.8% of the respondents acquired secondary education and above. About 55.8% of the respondents reported greater than or equal to 6 people as their family size while 41.7% of them had more than 11 years of smoking fish, and 53.4% of the respondents reported that charcoal was solely used as a material for smoking fish. The result further revealed that 31.7% indicated catfish as a specie of their smoked fish while 61.7% indicated others, e.g., titus, *shawa* etc. and 68.3% of the respondents had prior knowledge of food safety while 57.5% had access to useful food safety practices with only 26.7% had access to loan.

Table 1. Socio-Economic Characteristics of the Respondents

Variables	Categories	Frequency	Percentage%
Age	≤30	25	20.8
	31-40	22	18.4
	41-50	27	22.5
	51-60	27	22.5
	≥60	19	15.8
Sex	Male	29	24.2
	Female	91	75.8
Marital status	Single	26	21.7
	Married	71	59.1
	Divorced	6	5.0
	Widowed	17	14.2

Level of education	No formal education	18	15.0
	Primary education	41	34.2
	Secondary education	48	40.0
	Tertiary education	13	10.8
Family size	2-5	53	44.2
	6-9	49	40.8
	>9	18	15.0
primary occupation	farming	6	5.0
	civil servant	8	6.7
	trading	81	67.5
	others	25	20.8
Years of smoking fish	≤10	70	58.3
	11-20	17	14.2
	21-30	23	19.2
	>30	10	8.3
Materials for smoking fish	firewood	33	27.5
	gas	4	3.3
	charcoal	64	53.4
	oven	19	15.8
Types of smoking kiln	fulldrum	51	42.5
	half drum	69	57.5
Source of capital	friends/relatives	30	25.0
	bank loan	16	13.3
	cooperative	34	28.4
	others	40	33.3
Species of smoked fish	catfish	38	31.7
	tilapia	8	6.6
	others	74	61.7
prior knowledge of food safety	Yes	82	68.3
	No	38	31.7

access to useful food safety practises	Yes	69	57.5
	No	51	42.5
access to bank loan	Yes	32	26.7
	No	88	73.3

Source: field survey, 2022

3.2 Food safety practices

The results from Table 2 showed that 97.5% of the respondents washed their hands before and after smoking their fish, implying that the majority of the smoked fish sellers had good knowledge of food safety and were aware that washing their hands before and after smoking their fish reduces the risk of their fish from getting contaminated. Also, 72.5% of the respondents cleaned and sanitised their equipment while 30.8% preserved their smoked fish with chemicals. This negates the results of Adeyeye *et al.*, (2015); Yerima and Ngulde, (2015) who reported that most of the smoked fish sellers preserved their smoked fish with chemicals in order to increase the shelf life. Though only a few of the smoked fish sellers preserved their smoked fish with chemicals, there is still a need to monitor and campaign against the use of chemicals to preserve smoked fish as it is harmful to the health. The result further revealed that 96.7% of the respondents separated their thawed fish from the smoked ones, the majority of the respondents were aware of the importance of separating thawed fish from smoked ones. Also, 52.5% of the respondents refroze their thawed fish while others claimed they did not have left over thawed fish. Also, 99.2% of the smoked fish sellers swept their work space before and after processing. Only 32.5% covered their smoked fish, implying that most of the respondents exposed their smoked fish to the risk of getting contaminated. From the result, it can be inferred that majority of the smoked fish sellers were food safety compliant. The only place they were lacking was in the covering of their smoked fish and most of them exposed their fish, which is quite harmful. This study shows that the smoked fish sellers had good knowledge of food safety

Table 2: Distribution of respondents by their food safety practices

S/N	Food safety practices	Frequency	Percentage
1.	Washing of hands before and after processing	117	97.5
2.	Sanitising of equipment	87	72.5

3.	Preservation your smoked fish with chemicals	37	30.8
4.	Separation of smoked fish from raw fish	120	100%
5.	Refreezing of thawed fish	63	52.5
6.	Sweeping of the working space before or after processing	119	99.2
7.	Covering of smoked fish	39	32.5

Multiple responses

Source: Field Survey, 2022

3.3 Factors determining the number of safety practices used by the Respondents

Table 3 shows the results of the Tobit regression model analysis of the factors determining the number of food safety practices used by the smoked fish sellers. The number of food safety practices used was measured by the number of food safety practices adopted by the respondents. The likelihood estimates of the Tobit regression model show that chi-square (χ^2) statistic of 49.00 was significant ($P > 0.0001$) which implies that the regression model has a strong explanatory power. The pseudo coefficient of multiple determination (R^2) showed that 67.00 percent variation in the dependent variable was explained by the included independent variables. This implies that the model showed a good fit to the data. The Tobit regression model showed that the level of education, family size and access to useful food safety practices information were statistically significant at 5% while age was statistically significant at 10%, implying that these variables were the ones found to significantly influence the number of food safety practices used by the respondents in the study area.

From the result, a positive relationship between age and the number of food safety practices used by the respondents used was established. This implies the older the respondents, the higher the number of food safety practices used. This is in agreement with the study of Fapohunda and Olawumi (2022) The result also revealed a positive relationship between the level of education and the number of food safety practices used by the respondents. This means that the higher the level of education the higher the number of food safety practices used. This implies that being literate would help them to adopt more use of food safety practices. This result is in agreement with the study of Abah *et al.*, (2013) who concluded that the majority of the smoked fish sellers had some formal education. A positive relationship was established between family size and the number food safety practices used by the respondents. This implies that the

higher the family size the higher the number of food safety practices used. This study is in line with the findings of Nwalieji *et al.*, (2014) who concluded that a large family size guarantees the availability of labour.

Table 3: Tobit Regression results on food safety practices used by the respondents

Factors	Coefficient	Standard error	P-value
Age	0.0042*	0.0201	0.083
Marital Status	-0.0151	0.0226	0.507
Sex	-0.0029	0.0411	0.944
Level of education	0.0406**	0.0200	0.044
Family size	0.1466**	0.0068	0.034
Primary occupation	-0.0153	0.0248	0.538
Years of smoking fish	-0.0023	0.0023	0.318
Materials used for smoking	-0.0288	0.0179	0.100
Types of kiln	-0.0207	0.0386	0.594
Source of capital	0.0206	0.0153	0.100
Species of smoked fish	0.0072	0.0211	0.733
Prior knowledge on food safety	-0.0393	0.0620	0.528
Access to useful food safety practices information	0.0063**	0.0600	0.039
Access to bank loan	0.0002	0.0393	0.996

Source: Data analysis, 2022

LR chi square (14) = 49.00

Pseudo $R^2 = 0.67$

*, ** and ***represents 10%, 5% and 1% significance level respectively

3.4 Cost and Returns on food safety practices

The result from table 4 showed the mean cost of fish, electricity and fuel, transportation, labour, cleaning materials, charcoal/ firewood, food hygiene training and miscellaneous were ₦187,000, ₦35,000, ₦12,500, ₦21,750, ₦17,500, ₦8,400, ₦15,740 and ₦7,800 respectively, which gives a total mean cost of ₦305,690. The mean amount of the total income generated by the respondents

was ₦495,850. The total mean income was greater than the total mean cost. After deducting the total mean cost from the total mean income, a profit of ₦190,160 was realised. This implies that the business is profitable.

Table 4: Cost and returns on Food safety practices

S/N	Items	Mean (₦)
1.	Fish	187,000
2.	Electricity and fuel	35,000
3.	Transportation	12,500
4.	Labour	21,750
5.	Cleaning materials	17,500
6.	Charcoal/ firewood	8,400
7.	Food Hygiene Training	15,740
8.	Miscellaneous	7,800
	Total cost	305,690
	Total income	495,850
	Total income- total cost	190,160

Source: Field Survey, 2022

3.5 Constraints of food safety practices

The results from Table 5 showed that 68.3% of the respondents lacked public awareness on food safety. This implies that most of the smoked fish sellers had no public awareness on food safety. Although the respondents showed good knowledge of food safety, various studies have shown that good knowledge of food safety is not enough to implement good food safety practices and attitudes among smoked fish sellers and other food handlers (Walker *et al.*, 2003). Therefore, there should be a public avenue whereby the smoked fish sellers can get enough information and training they require on food safety. Also, 88.3% lacked storage facilities, the majority of the respondents complained about lack of storage facilities. The lack of storage facilities has affected them tremendously as this has led to some of the fish sellers using chemicals as preservatives for their smoked fish which is quite harmful to the health of the consumers. The study further revealed that 63.3% complained of inadequate infrastructural facilities, the majority of the

respondents complained about the lack of infrastructural facilities such as toilets, good roads, water and electricity. This lack of infrastructural facilities has affected their food safety practices tremendously, as some don't have electricity to power their freezer to keep their fish safe, no-good toilets etc. Also, 40.0% of the respondents complained of insufficient government incentive, few of the respondents complained about lack of government incentive. 41.7% complained about illiteracy, 60.0% complained about inadequate credit programs, 70.8% complained on insufficient technical knowledge while 60.0% complained on failure to follow procedures. This implies that the respondents are facing different problems and the most prominent problem is the lack of storage facilities. This study is in line with the findings of Omoruyi and Eronmhonbor, (2017) that shows that lack of storage facilities is the major problem of smoked fish preservation.

Table 5: Constraints of food safety practices

S/N	Constraints	Frequency	Percentage
1.	Lack of public awareness on food safety	82	68.3
2.	Lack of storage facilities	106	88.3
3.	Inadequate infrastructural facilities	76	63.3
4.	Insufficient government incentive	48	40.0
5.	Illiteracy	50	41.7
6.	Inadequate credit program	48	40.0
7.	Insufficient technical knowledge	85	70.8
8.	Failure to follow procedure	48	40.0

Multiple responses

Source: Field Survey, 2022

Conclusion

This study inferred that the majority of the smoked fish sellers were relatively young, fairly educated, married and female. It concluded that the major food safety practices among the respondents were washing of their hands before and after smoking their fish and sweeping of their workspace before and after processing. Age, level of education, family size and access to

useful food safety practices were found to significantly influence the number of food safety practices used by the respondents in the study area. The study concluded that smoked fish marketing is a profitable business.

Also, this study concluded that the major constraints to the use of food safety among the smoked fish sellers is the lack of storage facilities.

Recommendations

Arising from the results of this research study, it is therefore suggested that;

In order to ensure food safety practices among the respondents, there is a need to publicly sensitise the respondents on how to practise food safety and showing them the benefits of food safety and the risk of not practising food safety. There must be mandatory training on food safety for any individual that wants to go into the fish smoking business.

The ministry of health should monitor the personal hygiene of smoked fish sellers, this would go a long way in promoting food safety.

In the course of this study, it was revealed that the major constraint facing the smoked fish sellers was the lack of storage facilities, it is therefore recommended that government should endeavour to donate storage facilities to the respondents in order to ease their problem of food safety

Policy makers should make it a must to train smoked fish sellers on food safety on a regular basis.

Government officials should also regularly monitor and inspect the smoked fish sellers.

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