Determinants of Food Safety Practice and Knowledge Level among Food Vendors in Ado-odo/Ota Local Government Area, Ogun State, Nigeria

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ABSTRACT

Background: *Poorly prepared food has been attributed to many deaths over the years, and thousands of people around the world are at risk of foodborne diseases. Thus, the place of food vendors in ensuring safe handling practices in food preparation is of great importance. The objectives of the study were to describe the socioeconomic characteristics of the food vendors, examine food safety knowledge and practice level as well as to determine the factors influencing food safety practice among food vendors in the study area.*

Methods: *A cross-sectional survey design was adopted and multistage sampling technique was used to sample 120 food vendors in the study area. A structured questionnaire designed to meet the study objectives and also validated by the experts in the team was used to elicit information on the socio-economic characteristics, food safety knowledge and food safety practices. The data collected were subjected to descriptive analysis, mean criterion and logit regression using Statistical Package for Social Sciences (SPSS) software version 20.*

Results: *The findings indicated that the majority (87.5%) of the food vendors are female, with a mean age of 36.8 years. The food vendors (84.4%) have good knowledge of food safety but poor practice levels, as the mean criterion value of 1.4 obtained from the study was significantly lower than the standard mean criterion value of 2.5 at 1 percent significance level. Food vendor's age ($\beta = -0.19$, $p < 0.01$) and monthly income ($\beta = 2.77$, $p < 0.01$) significantly impacted food safety practices.*

Conclusion: *Food vendors in the study area have a sufficient understanding of food safety, however the level of food safety practice is low. Educative programmes on proper food handling practices is crucial.*

Keywords: Foodborne diseases, Food handling, Food safety training, Knowledge

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INTRODUCTION

Food, as one of the basic physiological needs, is vital for human survival. In recent times, the consumption of contaminated foods has given rise to myriads of food-health related problems like diarrhoea, dysentery and food poisoning. The issue of food safety has been of utmost public health importance (1). According to the World Health Organisation, food safety refers to the assurance that consumers will be free from any harm when food is prepared, served and consumed following its intended use (2). Sabir et al. (3) reported that over 2.1 million adults and 3 million children in developing countries die each year from drinking contaminated water or eating tainted food, despite the efforts made to improve food safety and the environment. One of the main threats to international health security is foodborne illness due to improper food handling among food handlers. This is evident from the rise in the number of deaths to the increase in the number of hospitalisations (4). According to previous studies

(5, 6), most foodborne illnesses are due to mishandling of food. The World Health Organization (2), reported that food handling personnels are critical in ensuring food safety throughout the food production and storage chain. Redmond and Griffith (7) reported that a significant number of foodborne infections arise from improper practices in the kitchen.

Food safety is quickly becoming a significant public health concern in Nigeria. However, there are some difficulties in recording outbreaks of foodborne illnesses nationwide (8). It is still a significant problem made worse by lack of awareness of proper food hygiene, the government's disjointed approach to food safety, and the lax enforcement of food safety laws and regulations (9). Several factors have been reported in the literature as being the cause of the rise in the outbreaks of foodborne diseases. Such factors include improper handling of food by food vendors, homemakers and consumers (14). However, of all these reported factors, the poor handling of food among homemakers, has been reported as the most significant factor promoting the outbreaks of foodborne diseases. According to Smith et al. (10), approximately 27.7% of food handlers in Nigeria do not wash their hands before handling food, and 28.1% only use water to wash their hands after using the lavatory.

Premagowri (11) claims that numerous studies have demonstrated that unsafe food handling practices, primarily used by homemakers, are a significant contributing factor in the development of many food-related diseases. Additionally, Adebisi et al. (4) believed that rural Nigerian women's lack of awareness and sensitisation is a more significant factor in problems related to food and health. This was also in line with earlier findings (12) who reported that one of the reasons for the rise in foodborne illness in many rural areas of Nigeria is a lack of adequate education on food safety practices.

According to a study by Hassan et al. (13), improper home food handling procedures, including inefficient cooking and storage techniques, cross-contamination and temperature abuse among others are some of the factors that contributed to the outbreak of foodborne illnesses. Despite the numerous studies conducted to determine the attitudes and knowledge of food vendors towards food safety practices, little is known about whether knowledgeable vendors actually put their knowledge into practice, as well as the factors that determine the level of food safety practice. Additionally, homemakers were the primary participants in the majority of studies on the knowledge and practice of food safety that were conducted in Nigeria (6). There is a knowledge gap regarding the relationship between prevailing food safety knowledge and practices among food vendors in the study area, and as such, it is critical to ascertain the level of food safety practices and associated factors among food vendors in Ogun State. This study looks into food safety knowledge, practices and related factors among food vendors against this background.

MATERIALS AND METHODS

Study Area

The study was conducted in Ogun State's Ado-Odo/Ota local government area. The State is situated in Nigeria's South-West geopolitical region. The state has a total area of 16409.26 sqm and is located between latitudes 6.20N and 7.80N and longitude 3.00E and 5.00E. The Local Government is the second largest of the State's 20 Local Governments. With Lagos State in the south, Yewa South and Ifo Local Government in the west, and Ipokia Local Government in the north, the Local Government shares borders. According to National Bureau of Statistics (24), Ado-Odo/Ota local government area has an estimated population of 896,700 with the dominant economic activity being trading and farming. It is also one of the industrial hub in Ogun State.

Data Collection

A structured questionnaire that was designed according to the objectives of the study as well as earlier documentation on the subject and validated by the food safety experts in the team was used to collect the respondents' primary data. Food vendors across the local governments who came from various socio-cultural backgrounds made up the respondents. The respondents were asked for information on socioeconomic characteristics (sex, age, marital status, level of education, monthly income from the food vending business), food safety knowledge, and food safety practices.

Knowledge Level on Food Safety

The food safety knowledge level of the respondents was measured using their responses to a set of 20 related questions on food safety knowledge following the work of (5, 15). Food safety knowledge level was measured on a four-point scale of "Yes", "No", "Do not know" and "Cannot remember". Respondents giving either “No” , “I don't know” or “I can't remember” as their responses to some food

safety related questions, when in the actual fact, the correct response is meant to be yes implies that they have a poor knowledge level. The mean value for these three category of responses were summed together and categorised as poor knowledge level.
Food safety knowledge level was determined using mean criterion with those scoring above 50% categorised as having "Good knowledge level" and those scoring equal or below 50% categorised as having "Poor knowledge level".

Level of Food Safety Practice
The food safety practice level was measured on a 3-point scale of "Always", "Sometimes" and "Never" responses to a set of 20 related questions on food safety practice as documented in earlier studies of (15). The food safety practice level was determined using the mean criterion. Respondents with less than the mean value of 2.5 were categorised as having a "poor level of practice", while those scoring above the mean value of 2.5 were categorised as having a "good level of practice.

Sample Size Determination
Respondents were selected using a multistage sampling technique. A total of five communities were randomly selected from the ten communities in the study area in stage one. In stage two, twenty-five food vendors were selected using simple random technique in each of the community, with each community representing a stratum, this gives a total of 125 food vendors. However, the information supplied by 120 food vendors was subjected to final analysis due to incomplete information supplied by some of the food vendors.

Statistical Analysis
Analytical techniques used included descriptive statistics like mean, frequency counts and percentages for the description of the socio-economic characteristics of the food vendors. Mean criterion were to determine the food safety knowledge and practice level while logistic regression model to identify the factors influencing food safety practice among the food vendors. Data collected were analysed using Statistical Package for Social Sciences (SPSS) software version 20.

Logistic Regression
This was used to determine the factors associated with the level food safety practice of the food vendors. The response variable takes a value of "0" or "1". The model can be represented explicitly as:

The specification function can be written as;

$$\text{Prob}(Y=1/X) = \text{Ln}(p/1-p) = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6$$

Where Y = Food safety practice level of respondents (1 if good; 0 otherwise)
X_1 = Age of food vendors (Years)
X_2 = Level of education (formal education = 1; 0 otherwise)
X_3 = Household size (number of persons)
X_4 = Monthly income from food vending business (naira)
X_5 = Food training attendance (attended = 1; 0 otherwise)
X_6 = Food safety knowledge level (good knowledge level = 1; 0 otherwise)
μ = error term

RESULTS

Socioeconomic Characteristics of Food Vendors
The food vendors' socioeconomic characteristics were shown in Table 1. The result revealed that the majority (87.5%) were females, while the male food vendors were just 12.5%. Age distribution of the food vendors reveals that a cumulative 86.7% were not older than 50 years. The average food vendor in the study area was 36.8 years. More than half (57.5%) of the respondents in the study area were married, while 27.5% were single. Regarding educational qualification, 20.8% had primary education, while 33.3% and 25.8% had secondary and tertiary education, respectively. The distribution of food vendors according to their years of experience in the food vending business showed that 75.8% had between 1-10 years of food vending experience, 20.8% had between 11-20 years of experience, while very few (3.3%) had over 20 years food vending experience. The average food vending experience was 6.6 years. The household size distribution of the food vendors showed that the majority (72.5%) had between 1-5 persons in their households, while 27.5% had between 6-10 persons in their household. The mean household size was 5 persons. The distribution of food vendors by whether they have undergone training on food safety or not showed that a large number (60.8%) had undergone some form of training on food safety while just 39.2% had not. Monthly income generated from the food vending business showed that 36.7% generated ₦30,000 or less, while only 5.8% earned above ₦90,000 from food vending. The mean income was revealed to be ₦44,462.50.

Table 1: Socio-economic Characteristics of Food Vendors

Personal characteristics	Frequency	Percentage	Mean
Sex			
Male	15	12.5	
Female	105	87.5	
Age (years)			
≤30	48	40.0	
31-40	30	25.0	
41-50	26	21.7	
51 and above	16	13.3	36.8
Marital Status			
Single	33	27.5	
Married	69	57.5	
Widowed	11	9.2	
Divorced	7	5.8	
Level of Education			
Non-Formal	24	20.0	
Primary	25	20.8	
Secondary	40	33.3	
Tertiary	31	25.8	
Food Vending Experience (years)			
1-10	91	75.8	
11-20	25	20.8	
Above 20	4	3.3	6.6
Household Size (number of persons)			
1-5	87	72.5	
6-10	33	27.5	5
Food Safety Training (years)			
Yes	73	60.8	
No	47	39.2	
Monthly Income from Food Vending (naira)			
≤30,000	44	36.7	
30,001-60,000	57	47.5	
60,001-90,000	12	10.0	
Above 90,000	7	5.8	44,462.50

Food Safety Knowledge Level among Food Vendors

Table 2 shows food vendors' food safety knowledge level in the study area. The table shows the percentage response of respondents in the study area to various food safety related questions. From the result the majority (91.7%) were aware of food poisoning. This means that the food vendors in the study area were aware of the fact that food poisoning poses a severe threat to the health of their consumers.

The table also reveals that nearly half (49.2%) of the respondents had never experienced any food poisoning-related incident. Furthermore, 96.7% of the respondents agreed that good personal hygiene practices can prevent the contamination of food meant for consumption by consumers.

Apart from revealing the percentage response of each question, the result further showed the average percentage of each response category.

Table 2: Level of Food Safety Knowledge among Street Food Vendors (n=120)

S/N	Statement	YES f (%)	NO f (%)	IDK f (%)	ICR f (%)
1	Aware of food poisoning.	110 (91.7)	10 (8.3)	0 (0)	0 (0.0)
2	Experienced food poisoning.	55 (45.8)	59 (49.2)	1 (0.8)	5 (4.2)
3	Aware of how to prevent food poisoning.	96 (80.0)	20 (16.7)	3 (2.5)	1 (0.8)
4	Gloves usage while handling food reduces the risk of food contamination.	101 (84.2)	13 (10.8)	6 (5.0)	0 (0.0)
5	Food poisoning can have health and economic effects on the society.	98 (81.7)	11 (9.2)	11 (9.2)	0 (0.0)
6	Children, pregnant women and older individuals are more at risk of food poisoning.	109 (90.8)	4 (3.3)	7 (5.8)	0 (0.0)
7	Hand washing before handling food reduces the risk of food contamination.	116 (96.7)	1 (0.8)	2 (1.7)	1 (0.8)
8	Hand washing after handling raw food prevents food borne diseases.	112 (93.3)	2 (1.7)	6 (5.0)	0 (0.0)
9	Diarrhea can be transmitted through contaminated food.	110 (91.7)	2 (1.7)	7 (5.8)	1 (0.8)
10	Micro-organisms can be found on the surface of human skin, nose and mouth of a healthy handler.	93 (77.5)	4 (3.3)	21 (17.5)	2 (1.7)
11	Personal hygiene can prevent food contamination.	116 (96.7)	1 (0.8)	3 (2.50)	0 (0.0)
12	Contaminated water can be a vehicle for transmission of food borne diseases.	117 (97.5)	1 (0.8)	2 (1.7)	0 (0.0)
13	Storing raw and cooked food together can cause contamination of food.	113 (94.2)	1 (0.8)	6 (5.0)	0 (0.0)
14	Food handler having diarrhea, flu and sore throat can also cause food contamination.	109 (90.8)	1 (0.8)	10 (8.3)	0 (0.0)
15	Leftover, smelling food is still safe to eat.	2 (1.7)	118 (98.3)	0 (0.0)	0 (0.0)
16	Dishing, serving and tasting food with unprotected hands can cross contaminate food.	110 (91.6)	5 (4.2)	5 (4.2)	0 (0.0)
17	Unkempt and dirty nails can easily spread bacteria.	118 (98.3)	0 (0.0)	2 (1.7)	0 (0.0)
18	Uncovered abrasion or cuts on fingers and hands can cross contaminate food.	113 (94.2)	2 (1.7)	5 (4.2)	0 (0.0)
19	Food borne illness can be acquired from consumption of contaminated food.	117 (97.5)	1 (0.8)	2 (1.7)	0 (0.0)
20	Inadequate cooking of raw food like meat, chicken and vegetable can cause outbreak of food borne illness.	111 (92.5)	1 (0.8)	8 (6.7)	0 (0.0)
	Mean Percentage	**84.4**	**10.7**	**4.5**	**0.4**

IDK: I don't know
ICR: I can't remember

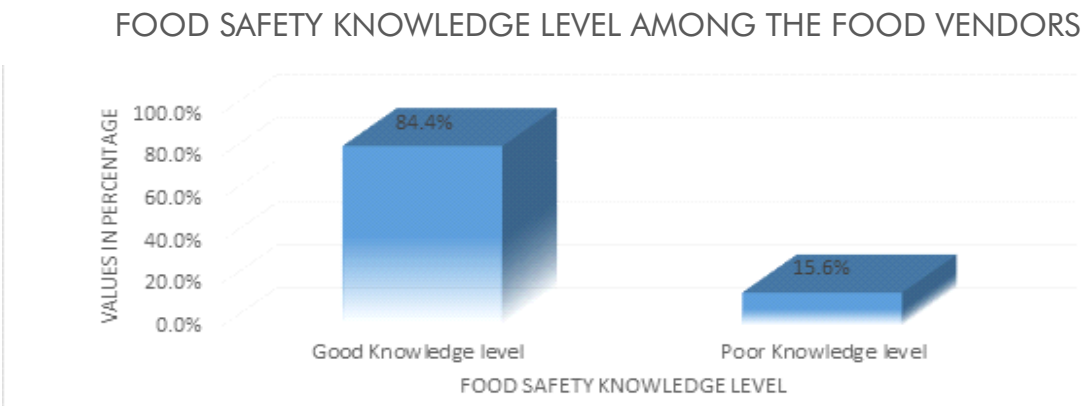

Figure 1: Food Safety Knowledge Level among Food Vendors

Figure 1 reveals that 84.4% of the respondents had a good knowledge of food safety, while 15.6% had poor knowledge level. On the Y axis lies the values in percentages while X axis shows the knowledge level.

Food Safety Practice Level among Street Food Vendors

Table 3 reveals the mean rating of the level of food safety practices among food vendors in the study area. The result reveals a grand mean value of 1.42 and a standard deviation 0.52. This is significantly below the mean criterion of 2.5, implying that food vendors in the study area do not have good food safety practices. This shows that although respondents have a good knowledge of food safety, they do not practice it.

Determinants of Food Safety Practice Level among Food Vendors

Table 4 shows the determinants of food safety practices among respondents in the study area. The results are displayed as a probability function. Six explanatory variables were included in the econometric model of determinants of food safety practice, from which four significantly influenced food safety practices among food vendors in the study area. The model fits according to the log likelihood value of -147.260 with a p-value of 0.000. The model's effectiveness was assessed using the chi-squared value and the log likelihood ratio criteria.

The result revealed a significant relationship between age, income, food safety training, food safety knowledge and respondents' food safety practices. The result also showed a negative relationship between respondents' age ($p<0.01$) and their food safety practice level. This means that older food vendors who might have been thought to be exceptionally experienced and have good food safety knowledge, have poor food safety practice levels. Income is positively significant, which implies that as the income from the food vending business increases, the likelihood of increasing food safety practice levels increases. Food safety training ($p<0.01$) and knowledge level ($p<0.01$) also increase the likelihood of food safety practices among food vendors. The likelihood of food safety practice will specifically increase by 97.9% among the food vendors that had undergone some form of food safety training than those who did not. Furthermore, food safety knowledge level ($p<0.01$) increases the likelihood of food safety practices among the food vendors than those who do not have. However, the result also showed that some variables, such as level of education have no significant impact on food safety practice among respondents.

DISCUSSION

The age distribution of the food vendors implies that they are primarily young and within their economic and productive age. From the result in the table, the majority (91.7%) are aware of food poisoning. This agrees with the earlier findings of (15), who revealed in their study that 97.9% of food vendors are aware of food poisoning. Figure 1 reveals that 84.4% of the respondents have a good knowledge level of food safety, while 4.5% have little to no knowledge at all. This implies the food vendors in the study area are knowledgeable about food safety. This is similar to the findings of Henok and Wilson (16), who found out in their study of food safety practices and its associated factors among mothers

Table 3: Level of Food Safety Practices among Food Vendors (n=120)

Statement	Always (%)	Sometimes (%)	Never (%)	Mean	SD
1 Wash hands before and after cooking.	90.8	9.2	0.0	1.09	0.290
2 Consumption of food left for long at room temperature.	30.0	35.8	34.2	2.04	0.803
3 Cover mouth with hands while coughing or sneezing.	48.3	37.4	14.2	1.66	0.716
4 Taste and dish out food with unprotected hands.	25.8	30.8	43.3	2.18	0.816
5 Wash fruits and vegetables before eating.	88.3	10.8	0.8	1.13	0.357
6 Read conditions of use and storage of packaged food.	58.3	32.5	9.2	1.51	0.661
7 Read labels with the use and/or expiry date of packaged food before purchasing.	55.8	40.8	3.3	1.48	0.565
8 Wash eggs before cooking or frying them.	70.8	26.7	2.5	1.32	0.518
9 Wash and rinse cutting boards, knives and plates used for raw meat before using them for other food	70.8	28.3	0.8	1.30	0.478
10 Defrost frozen food outside the refrigerator.	70.8	24.2	5.0	1.34	0.572
11 Wear accessories like rings, bracelets when cooking food.	25.8	40.8	33.3	2.08	0.769
12 Use an apron when cooking.	57.5	31.7	10.8	1.53	0.685
13 Store raw meat or chicken separately from food.	83.3	16.7	0.0	1.17	0.374
14 Wash dishes with detergent and water or in a dish washer after preparing food.	90.8	6.7	2.5	1.12	0.393
15 Wash hands before handling raw food.	86.7	10.8	2.5	1.16	0.430
16 Wash dishes with detergent and water or in a dish washer, while preparing food.	92.5	6.7	0.8	1.08	0.306
17 Cover your cuts with bandage and use gloves.	65.0	35.0	0.0	1.35	0.479
18 Keep food unrefrigerated for more than 2 hours.	40.0	47.5	12.5	1.73	0.673
19 Protect raw food from insects and rodents.	94.2	5.8	0.0	1.06	0.235
20 Protect cooked food from insects and rodents	94.2	5.0	0.8	1.07	0.282
Grand Mean				**1.4**	**0.52**

Table 4: Logit Regression Result of the Determinants of Food Safety Practice Level among Food Vendors

Variables	Estimated ß values	Standard error	z-value	p>|z|
Age	-0.190***	0.034	5.588	0.000
Education	-19.976	79.68	0.250	0.998
Household size	0.106	0.176	0.602	0.547
Income from food vending	2.768***	0.543	5.098	0.001
Food safety training	0.979***	0.307	3.189	0.002
Food safety knowledge level	2.053***	0.748	2.745	0.004
Constant	2341.76	62.106	37.706	0.000
Log-likelihood function	-147.260			
^{2} of Likelihood Ratio test (df = 9)	49.70			
Pro>chi^2	0.000			
Number of observation	120			
Pseudo R^2	0.354			

****implies significance at p<0.01*

in Northwest Ethiopia, that 75.9% of respondents have a good knowledge of food safety. Iwu et al. (9) also reported similar findings in their study on food hygiene knowledge, attitudes and practices among food vendors in Owerri, Imo State. Their findings showed that 81% of the respondents have a good knowledge of food hygiene.

Furthermore, a study on the knowledge and practice of food safety among local restaurant operators in Rivers State (15) revealed that 82.6% of respondents had good knowledge of food safety. Food safety knowledge findings showed that the respondents have a good knowledge of food safety, but they do not practice it. This agrees with the findings of Chinenye-Julius and Atulomah (6), who reported that food vendors only have a moderate level of food safety practice. This also is corroborated by the earlier documentation of (17), who, in their findings, reported poor food safety practices among food vendors at the University of Ethiopia. However, this is in contrast to the findings of (15), who revealed that food vendors have a good safety practice level. Henok and Wilson (16), also revealed that 49.6% of the respondents had a good level of food safety practice, while 50.4% had a poor level of self-reported practice. Furthermore, Samuel and Amini (15) in their study of the knowledge of food-borne infection and food safety practices among local food handlers in Ijebu-ode local government, Ogun State, found out that only 31.5% of respondents have poor food safety practices level.

The logit result on the determinants of food safety practice level among the food vendors also showed a negative relationship between respondents' age ($p<0.01$) and their food safety practice level. This means that older food vendors who, although might be entirely experienced and have good food safety knowledge, may need better food safety practice levels. Samuel and Amini (15) reported that the practice of proper food safety might be poor among elderly people who, most of the time, hold firmly to their superstitious beliefs.

Food safety training ($p<0.01$) and knowledge level ($p<0.01$) also increase the likelihood of food safety practices among food vendors. The likelihood of food safety practice will specifically increase by 97.9% among the food vendors that had undergone some form of food safety training than those who did not. This result is in tandem with the earlier documentation (19, 20) that food safety training improved food safety practices among food handlers.

Furthermore, food safety knowledge level ($p<0.01$) increases the likelihood of food safety practices among the food vendors. This corroborates the findings of Sharif et al., Bamidele et al., (21, 22) who reported that good food safety knowledge level improves food safety practices among food handlers.

However, the result showed that some variables,

such as level of education have no significant impact on the practice of food safety among respondents. This is in line with the findings of Samuel and Amini (15) who reported no significant relationship between educational level and food safety practice. The same is also reported in the study (23) of food safety knowledge and hygiene practices among veterinary medicine students at Trakia University, Bulgaria.

CONCLUSION

This study evaluated the factors influencing food safety practices and knowledge among food vendors in Ogun State. Most food vendors in the study area are knowledgeable about food safety by attending food safety training. This, however, couldn't translate into good food safety practice as food vendors scored below the 2.5 mean criterion set for food safety practice with an average mean of 1.42. This showed that their knowledge of food safety is not put into practice.

The result of the logit model revealed that food vendors' age, income, food safety training and food safety knowledge level are significant factors that influence food safety practices. Based on the findings of this study, the following recommendations are suggested for implementation:

Since the result of this study clearly showed that the food safety practice level is worse among older street food vendors and it declines as they age, therefore, sensitisation programmes and events targeted at raising awareness on the impact of improper food safety practices among this class of food vendors should be implemented. In addition, programmes that could bring older food vendors in contact with their younger counterparts should be organised to facilitate the exchange of information and knowledge. Furthermore, regular training is also recommended since food safety training promotes food safety practices among the respondents.

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