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FOOD HYGIENE KNOWLEDGE, ATTITUDE AND PRACTICE AMONG STREET FOOD VENDORS IN OJO LOCAL GOVERNMENT AREA, LAGOS STATE

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ABSTRACT

Introduction: Low and middle-income countries are currently dealing with the problem of foodborne illness connected to food consumption infected by microbes isolated from ready-to-eat items sold on the street, causing the death of about 200,000 Nigerians every year. **Objectives**: This study determined food hygiene knowledge, attitudes, and practices among street food vendors in Ojo Local Government Area of Lagos state, Nigeria. **Methods**: A descriptive cross-sectional study employed a multi-stage sampling technique to select 399 street food vendors in Ojo LGA Lagos. Data collection was carried out using an interviewer-administered questionnaire and observational checklist. IBM SPSS (Version 25) was used for analysis, and the association between variables was determined using Chi-square. The level of significance was set at P= < 0.05. **Results:** Only 70% of the food vendors had good knowledge of food hygiene, positive attitude towards food hygiene 92%, good self-reported food hygiene practices 67%, while the observed food hygiene practices were poor 58%. Education had an influence on knowledge of food hygiene among food vendors (P= 0.028). The food vendors' attitude was associated with gender (P= 0.000) and educational level (P=0 .035), while the observed practice of food hygiene was associated with age (P= 0.041) and educational level (P= 0.041). **Conclusion**: Despite the good knowledge and attitude observed, food hygiene practices were poor among the food vendors. Education was the only factor associated with knowledge, and gender and education were associated with attitude, age and education were associated with observed practice. All food vendors need health education and continuous monitoring strategies.

KEYWORDS: Food hygiene, Street foods, Foodborne diseases, and Food vendors.

INTRODUCTION

Food borne diseases are a serious public health concern in both industrialised and developing countries, causing a wide range of illnesses, and are responsible for a sizeable part of morbidities and mortalities worldwide.[1] Street food vendors significantly influence the health of the public, and one of the key factors is ready-to-eat food. When meals are improperly prepared, careless food handling and poor hygiene in Nigerian eateries, cafeterias, and restaurants can increase illness transmission.[2,3] Food contamination along any of the manufacturing processes will compromise food hygiene, and this depends on the environmental temperature, humidity, and pH values in which it is stored, making food potentially harmful to human health.[4]

Efforts have been made to tackle the problem pertaining to food hygiene, but the problem keeps increasing, causing 1.5 million global episodes of diarrhea annually, mainly in developing countries, resulting in 3 million deaths among children less than 5 years old.[5] Globally, about 30% of individuals are affected annually. Food sold outside the home has been found in up to 70% of trace outbreaks.[6] In Africa, foodborne diseases are estimated at 3.3 to 4.1 episodes per child per year.[7] Nigeria is currently dealing with issues of foodborne illness, which are typically underreported unless there is an outbreak. An epidemic of botulism connected to food consumption in Abuja was reported to the Nigeria Center for Disease Control in 2018.[8]

Food contamination thus puts a great deal of social and financial strain on communities vulnerable to disease outbreaks. In the United States of America, diseases brought on by pathogens were projected to have cost the country 35 billion US dollars in medical expenses and lost productivity in 1997. In 1991, the cholera outbreak in Peru caused 500 million US dollars worth of losses in

food products.[9] In developing countries, the outbreak can have a devastating economic effect. As a result, global concerns relating to food hygiene must be quickly recognised by the food industry, such that awareness of food hygiene is increased, and government organisations collaborate to advance food hygiene.

The World Health Organization reported that 1 in 10 persons get sick through consumption of contaminated food, and about 420,000 adults and 125,000 children (younger than five years old) die each year from foodborne diseases.[10] This directly impacts human health with increased costs in healthcare, economics, and welfare. Among low-income countries, pathogenic Escherichia coli has been implicated in causing cholera from contaminated food, while campylobacter is a major problem in high-income countries.[11] Furthermore, the Ministry of Science and Technology states that about 200,000 Nigerians pass away every year due to food poisoning.

Studies in Kenya, Uganda, Ghana, and Nigeria revealed that food prepared and sold on the streets caused serious health consequences because most food vendors lack knowledge about the risks of unhygienic practices and do not observe hygiene control practices.[12] Occasionally, errors such as not wearing gloves while preparing or serving food, handling food with their hands, and talking while handling food were observed among food vendors. Furthermore, lack of washing hands after handling raw foods and before shifting to handling cooked foods, sick food vendors present at vending sites and inadequate food hygiene training was observed to cause foodborne diseases.[13] There has been no documentation on foodborne illness in Ojo local government area in the past. This study seeks to determine food hygiene knowledge, attitudes, and practices among street food vendors in the Ojo local government area of Lagos state, Nigeria.

The findings in this research will make it easier to determine food vendors needs for health education and training. When their training requirements are determined, it will serve as a starting point and planning tool for interventions like health education and food hygiene campaigns. The assessment is required to investigate where street food vendors understanding of food hygiene is lacking, planning and evaluating evaluations for health education. The evaluation results will also be a helpful tool for the World Health Organization (WHO), Food agricultural organisation (FAO), the Federal and State Ministries of Health and concerned Non-Governmental Organizations for the street food vendors to improve their food hygiene knowledge, attitude, and practice. This will significantly lessen the financial burden of morbidity and mortality from foodborne diseases.'

METHODS

A descriptive cross-sectional study was conducted among street food vendors in Ojo LGAs, Lagos state. The sample size was calculated using the formula, where n = Z2pq/d2, with a prevalence of 42% from a previous study of good food hygiene knowledge.[14] The minimum required sample size (n) calculated was 374. To account for non-response, the sample size was increased by 10% = 420.

A multi-stage random sampling technique was used to select the sample. 5 out of the 11 wards in the local government were selected by simple random sampling (balloting), and 12 streets were in each ward. Simple random sampling (balloting) was used to select 7 street food vendors from each street. Any street less or equal to seven vendors, all the vendors in such street were interviewed. Eligibility was limited to those directly involved in food preparation, handling, and sales on the street.

Data were collected using a semi-structured, interviewer-administered questionnaire and observational checklist.[15] The questionnaire was divided into four sections: Sociodemographic characteristics of the food vendors, food hygiene knowledge, food hygiene attitude, and food hygiene practices. Possible answers for knowledge are listed, e.g. Yes/No/I don't know, coded in numbers (1) and (0), respectively. Questions on attitude were asked based on a 5-point Likert rating scale with codes as strongly agree (5), agree (4), undecided (3), disagree (2) and strongly disagree (1), while questions on practice were asked based on a 3-point Likert rating scale coded as always (3), rarely (2), and never (1) to facilitate statistical analysis. The checklist was used to collect data on the observed practice and the availability of essential equipment for food hygiene practices. The questionnaire and the checklist were adapted from the WHO 5 Keys to Safer Food Handling, which contains recommended food hygiene standards. Five research assistants fluent in English, pidgin English and Yoruba (Lagos's prevalent language) were trained on the data collection method. A pretest was done among 42 street food vendors for the validity and reliability of the questionnaire and was modified based on feedback from the field.

Data was analysed using a statistical package for social sciences (SPSS) version 25. Frequency distribution and tables were used to describe the data. The score was collated and converted to 100%. There were 50 responses to assess respondents' knowledge of food hygiene. The respondent was assigned a "1" mark for each correct score and 0 for wrong responses. Scores between 25 (50%) and 50 (100%) were recorded as good knowledge, and 0 to 24 (< 50%) were recorded as poor knowledge.[16] For attitude, there were 18 questions on a 5-point Likert scale rating, which gave 90 points to assess the attitude of the respondents towards food hygiene. Scores between 54 and 90 (50% -100%) were recorded as positive attitudes, and scores between 18 and

53 (< 50%) were recorded as negative attitudes. For practices, there were 28 responses, all on a 3-point scale (always =3, never = 1), which gave 84 points to assess food hygiene practice. Scores between 56 to 84 (50% - 100%) were reported as good practice, and scores between 28 and 55 (< 50%) were reported as poor practice16. Also, there are 19 responses in the observational checklist. Scores between 10 to 19 (50% - 100%) were rated as good practice, and scores below 10 (< 50%) were rated as poor practice.[16] The chi-square test was used to determine the association between variables with the significance level set at p = < 0.05.

Ethical approval with admin number ADM/DSCST/ HREC/APP/5762 was obtained from Lagos University Teaching Hospital, Idi-araba's human research and ethical committee (HREC). Lagos. Permission was obtained from the Executive Chairman of the Ojo LGA secretariat. Written informed consent was obtained from each respondent, and confidentiality was maintained throughout the study.

RESULTS

Socio-demographic characteristics of respondents

The mean age of the respondents was 34.9±8.5 years. The highest number of respondents were females (90.7%) with secondary education (65.9%) and belonged to the age group of 31-40 years old (59.1%). 70.9% were married, 83.5% were business owners, with less than half (45.4%) having job experience of 1-5 years old. 58.6% have received food hygiene training, 75.9% have refrigerators for food storage, and most (84.2%) used pipe-borne water for food preparation.

Food Hygiene Knowledge

The majority (95.5%) of the respondents were aware that consuming contaminated food may result in major health problems for an individual. Also, 89.5% knew they should cover any cuts or wounds on their bodies. Most respondents (95.2%) knew that keeping raw and cooked food separate helps avoid cross-contamination, whereas less than half (47.6%) knew that using the same cloth for cleaning hands, plates and cooking surfaces is not a good idea. (Table 1).

Table 1: Knowledge of Food Hygiene Among Street Food Vendors.

Variable	Frequency (n=399)	Percentage (%)
Eating foods contaminated with germs may be dangerous to health.	381	95.5
The possible disease caused by germs		
Food poisoning	288	72.2
Malaria	228	57.1
Hepatitis	64	16.0
Typhoid	251	62.9
Fever	172	43.1
Cholera	239	59.9
Ways of contacting food poisoning		
Contaminated food and water	359	90.0
Rats, cockroaches and flies contaminating food.	363	91.0
Contaminate utensils and wipe towels	271	67.9
Food hygiene can be achieved through		
Washing hands after using the toilet	391	98.0
Washing hands before starting food preparation and several times during food preparation.	384	96.2
Washing hands after handling money	393	98.5
Washing hands after handling rubbish	396	99.2
Washing hands after blowing nose	391	98.0
Washing hands after handling raw meat/poultry	396	99.2
Steps for hand washing		
Wet hands under running water thoroughly.	325	81.5
Rub hands together with soap for 20 seconds and wash.	361	90.5
Rinse hands under running water.	311	77.9
Dry hands with clean paper towels.	347	87.0
To ensure food hygiene, food vendors should:		
Not wearing nail varnish.	369	92.5
Always cut their nails short.	364	91.2
Not wear jewelries.	324	81.2
Not smoke or spit while preparing food.	351	88.0

Not put fingers in the nose.	361	90.5
Not sneeze, spit or blow nose in food.	355	89.0
Not expose cuts/wounds on their body but cover them	357	89.5
Food handlers suffering from cholera, diarrhea, cough, and hepatitis should not cook or serve food.	375	94.0
To ensure food hygiene, food handlers are supposed to wear		
Aprons	339	85.0
Gloves	182	45.6
Caps/hairnets	295	73.9
Cleaning cooking surfaces, cooking utensils, and wiping towels reduces the risk of food-borne illness.	361	90.5
The best materials for cleaning cooking surfaces, cooking utensils		
Detergents/soap and water only	316	79.2
Soap, warm water and sanitisers.	74	18.5
To protect food from rats, cockroaches and flies in the kitchen, food handlers should*		
Spray insecticides	239	59.9
Not dump used or dirty utensils, but wash. them immediately after use	339	85.0
Cover waste bins tight	354	88.7
Cover cooked food.	360	90.2
Ensure proper storage of raw food	325	81.5
The same wiping clothes should be used for both plates, hands and cooking tables	202	50.6
Separating raw from cooked food helps to prevent cross-contamination.	380	95.2
Raw meat, poultry and seafood need to be separated from each other after buying them	367	92.0
Separate knives and cutting boards should be used for handling raw food and cooked foods	360	90.2
In the refrigerator, where should raw meat/fish/poultry be stored to prevent cross contamination		
At the bottom, below other food	173	43.4
How do you know if meat/poultry/fish has been properly cooked and is safe to eat		
When the outside is evenly brown and inside colourless without pinkish colour	300	75.2
Cooked leftovers need to be thoroughly reheated before selling them	284	71.2
How often should cooked food be reheated		
Once	223	55.9
Twice	116	29.1
Don't know	60	15.0
How can you safely store perishable raw foods*		
Deep freezer/refrigerator open space	320 51	80.2 12.8
What is the ideal temperature for safe food storage		
Between 5-60 degree	158	39.6
Below 5 and above 60 degrees	49	12.3
Don’t know	192	48.1
Best time to store cooked food in the refrigerator		
At least 2 hours after cooking	308	77.2
Cooked food should be kept very hot before serving	362	90.7
Eggs, raw fruits, vegetables, and frozen meat need not be thoroughly washed before use	166	41.6
Source of water is safer for food preparation		
Water from well	102	25.6
Pipe-borne/borehole	297	74.4

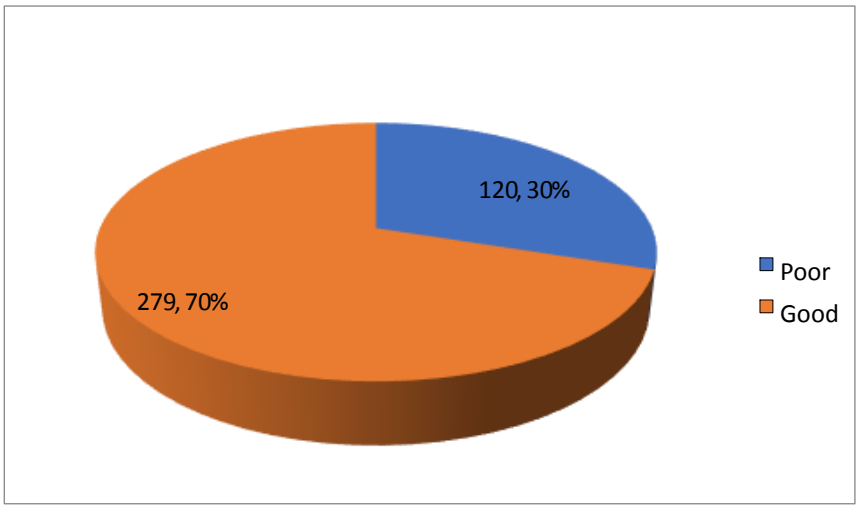

Figure 1: Overall knowledge level of food hygiene.

Food hygiene attitude

Many respondents (91.7%) agreed that food handlers must receive training on food hygiene. Most (98.5%) agreed that handwashing should be done at several intervals during food preparation. 98.2% and 97% agreed that cooking utensils and wiping towels should be washed with water, soap and sanitisers, and cooking surfaces should be washed with the same items, respectively. 96.2% agreed that it is safer to keep raw food and cooked food separate to prevent cross-contamination, while 96.2% agreed that inadequate cooking of poultry/meat/fish may cause food poisoning. 92.7% of respondents agreed that checking the refrigerator's temperature daily, is important to ensure safe food storage (Table 2).

Table 2: Respondents Attitude Towards Food Hygiene.

Variables	SA n (%)	A n (%)	UD n (%)	D n (%)	SD n (%)
Food hygiene and safety training is a great necessity for food handlers	160(40.1)	206(51.6)	12(3.0)	21(5.3)	
Hands should be washed before handling food and several times during the food preparation and serving	136(34.1)	257(64.4)	6(1.5)		
The use of warm water, soap and sanitisers for hand washing is very important to prevent food contamination	136(34.1)	254(63.7)	7(1.8)	2(0.5)	
Cooking utensils and wiping towels should be washed with soap, water and sanitisers immediately after use	133(33.3)	259(64.9)	7(1.8)		
Waste should be stored in tightly closed bins	134(33.6)	253(63.4)	12(3.0)		
Cooking surfaces should be cleaned regularly with soapy water and sanitisers to prevent food contamination	126(31.6)	261(65.4)	12(3.0)		
Use of caps, gloves and aprons is very important to reduce the risk of food contamination	125(31.3)	253(63.4)	17(4.3)	4(1.0)	
Separate water and bowls should be used in washing hands and cooking utensils	147(36.8)	236(59.1)	11(2.8)	4(1.0)	1(0.3)
Food handlers need to stay away from work if they are sick with diarrhea, cholera, hepatitis, cough and typhoid	134(33.6)	248(62.2)	17(4.3)		
Food handlers should maintain short nails and avoid nail varnish	138(34.6)	244(61.2)	14(3.5)	2(0.5)	1(0.3)
Food handlers with open wounds and abrasions on their fingers and hands should not unwrap food	130 (32.6)	254(63.7)	13(3.3)	2(0.5)	
It is safer to separate raw food from cooked food to avoid cross-contamination	133(33.3)	251(62.9)	15(3.8)		
Inadequate cooking of poultry/meat/fish and soup may cause food poisoning	136(34.1)	242(60.7)	20(5.0)	1(0.3)	
Improper food storage may be dangerous to health	133(33.3)	245(61.4)	21(5.3)		
It is important to check the temperature of the refrigerator daily to ensure the safe storage of food	134(33.6)	236(59.1)	29(7.3)		

Serving food while it is piping hot is important for good health	164(41.1)	155(38.8)	46(11.5)	33(8.3)	1(0.3)
It is necessary to check raw ingredients for freshness or expiry date before use	190(47.6)	193(48.4)	15(3.8)	1(0.3)	
It is necessary to use pipe-borne water/boreholes for food preparation	140(35.1)	241(60.4)	17(4.3)	1(0.3)	

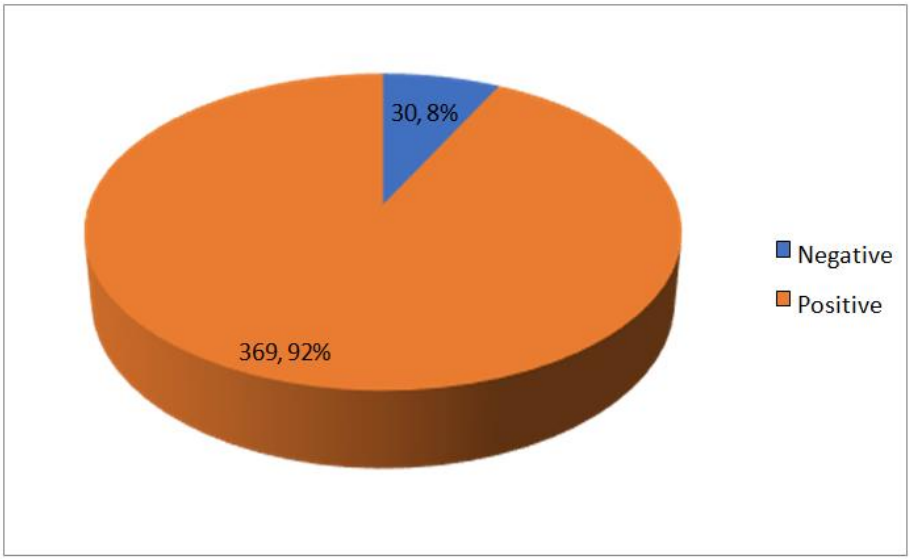

Figure 2: Overall rating of attitude towards food hygiene.

Food Hygiene practice

Almost all (81.5%) respondents practice washing their hands during food preparation. 82.7% practice washing their hands after using the toilet. Concerning protective wear, 68.7% wear gloves, 77.2% wear caps and 75.4% wear aprons. Most respondents (73.7%) collect refuse in a tightly covered dustbin. Almost all (80.7%) practice food reheating before sales, while 78.9% of the respondents use pipe-borne water for their business (Table 3).

Table 3: Reported Practice of Food Hygiene Among Street Food Vendors.

Variable	Frequency (n=399)	Percentage (%)
Hands are normally washed		
Wash your hands during food preparation.	325	81.5
After using the toilet/urinating	330	82.7
After blowing your nose/sneezing	326	81.7
After touching money/changing papers	319	79.9
After handling raw meat or poultry	324	81.2
Materials used in hand washing*		
Water and soap only	328	82.2
Warm water, soap and sanitiser	31	7.8
Use of water after hand washing		
Discard it	334	83.7
Materials worn during food preparation*		
hand	274	68.7
gloves	308	77.2
head ties/scarf/cap Aprons	301	75.4
Habits practised while handling food		
Use of jewelries	128	32.1
Use of nail varnish	135	33.8
Smoking	131	32.8
Spitting/coughing/blowing nose/sneezing near food	134	33.6
Wash cooking utensils immediately after use	299	74.9
What kind of water is used in washing, cooking utensils and wiping clothes		
Warm soapy water and sanitisers	315	78.9
Collect your solid waste in tightly covered dustbins	294	73.7
Solid wastes are disposed		

On daily basis	340	85.2
Handled raw and cooked food		
Use separate knives, and cutting boards in cutting raw and cooked food Store raw food separately from cooked in the refrigerator Separate raw fish/poultry/meat from other food	26 47 326	6.5 11.8 81.8
Often store your perishable raw materials		
In the refrigerator Open space	322 1	80.7 0.2
Reheat the cooked food before serving	322	80.7
Cook fish/poultry/meat until the inside is no longer pink before serving	294	73.7
You check raw ingredients for freshness and expiry date before using them for cooking	59	14.8
Source of water used in food preparation		
pipe borne/borehole. well water	315 62	78.9 15.5

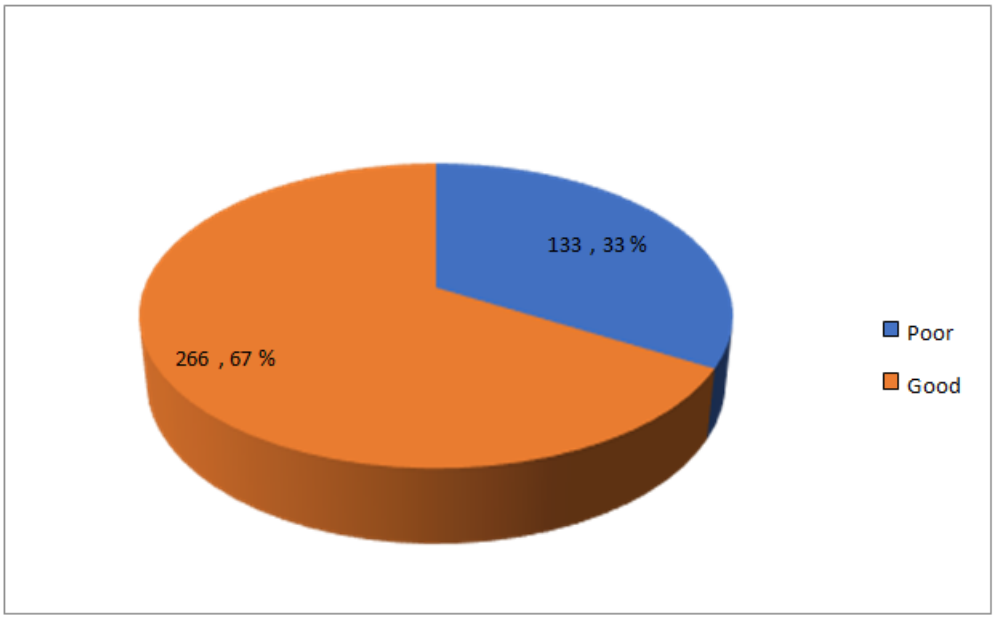

Figure 3: Overall rating of the reported practice of food hygiene among the respondents.

Food Hygiene Observational Checklist

On the on-the-spot assessment/observation of the availability of food hygiene equipment and the practice of food hygiene among the street food vendors at work, 81.5% of the vendors practised hand washing, 62.2% had bowls for washing hands, and 84.7% had soap for handwashing. 65% of respondents do not have a waste bin with a cover, 77.4% do not have a presence of sanitisers, and 82.2% do not have microwaves. (Table 4)

Table 4: Observational Checklist for Food Hygiene Among Street Food Vendors.

Observations	Yes Fre (%)	No Freq (%)
Washing of hands	325(81.5)	74(18.5)
Physical appearance (no discharge from nose, eyes, ears, etc.)	355(89.0)	44(11.0)
Covering of food with pot lids or other materials	362(90.7)	37(9.3)
Cooking on a neat table surface	335(84.0)	64(16.0)
Preparing food on the floor level	189(47.4)	210(52.6)
Cover mouth while coughing/sneezing	218(54.6)	181(45.4)
Bowl for hand washing present	351(88.0)	48(12.0)
Soap and for hand washing	338(84.7)	61(15.3)
Soap powder or liquid for washing dishes and utensils	329(82.5)	70(17.5)
A bowl/bucket for washing dishes and utensils	248(62.2)	151(37.8)
Apron	178(44.6)	221(55.4)

Cap/Scarf Worn	145(36.3)	254(63.7)
Gloves	113(28.3)	286(71.7)
Waste bin with cover	139(34.8)	260(65.2)
Availability of refrigerator in good working condition	122(30.6)	277(69.4)
Availability of tap water	116(29.1)	283(70.9)
Availability of sink	84(21.1)	315(78.9)
Presence of sanitisers/bleach	90(22.6)	309(77.4)
Availability of microwave	71(17.8)	328(82.2)

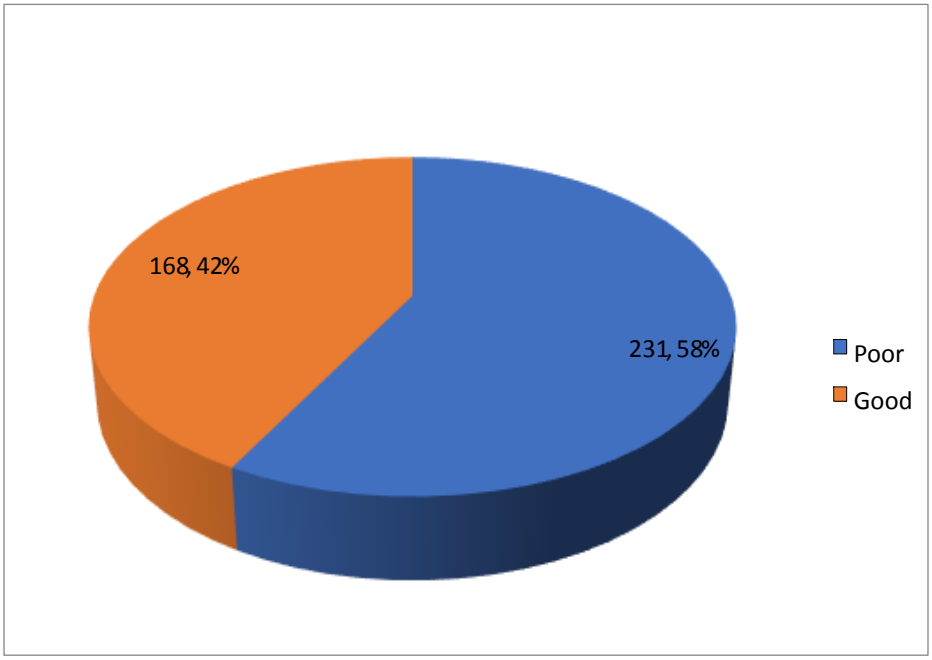

Figure 4: Rating of the Observed practice (From the observational checklist).

Association between socio-demographic characteristics of respondents and level of knowledge and attitude of food hygiene among street food vendors

The knowledge of food hygiene was highest within the age group of 51-60 years. There was a significant association between educational level and the knowledge level of food hygiene (P= 0.028). The food vendors' knowledge increased as the level of education increased. Gender was significantly associated with attitude toward food hygiene (p=0.000) and education (p=0.035). (Table 5).

Table 5: Association between socio-demographic characteristics of respondents and level of knowledge and attitude toward food hygiene among street food vendors.

Variable	Level of knowledge of food hygiene		$\chi 2$	P value	Level of food hygiene attitude		$\chi 2$	P value
	Poor	Good			Negative	Positive		
Age (years)								
<=20	7(43.8)	9(56.3)	7.42	0.115	2(12.5)	14(87.5)	7.24	0.124
21-30	19(30.2)	44(69.8)			9(14.3)	54(85.7)		
31-40	71(30.1)	165(69.9)			16(6.8)	220(93.2)		
41-50	22(33.8)	43(66.2)			3(4.6)	62(95.4)		
51-60	1(5.3)	18(94.7)			0(0.0)	19(100.0)		
Gender								
Male	14(37.8)	23(62.2)	1.17	0.280	10(27.0)	27(73.0)	22.32	**0.000**
Female	106(29.3)	256(70.7)			20(5.5)	342(94.5)		
Marital Status								
Married	82(29.0)	201(71.0)	0.96	0.617	18(6.4)	265(93.6)	2.68	0.262
Single	37(33.3)	74(66.7)			12(10.8)	99(89.2)		
Divorced/separated	1(20.0)	4(80.0)			0(0.0)	5(100.0)		
Level of education								

No formal education	20(35.7)	36(64.3)	9.11	**0.028**	0(0.0)	56(100.0)	8.63	**0.035**
Primary	12(34.3)	23(65.7)			4(11.4)	31(88.6)		
Secondary	83(31.6)	180(68.4)			25(9.5)	238(90.5)		
Tertiary	5(11.1)	40(88.9)			1(2.2)	44(97.8)		
Owner								
Yes	97(29.1)	236(70.9)	0.86	0.355	24(7.2)	309(92.8)	0.28	0.596
No	23(34.8)	43(65.2)			6(9.1)	60(90.9)		
Years in food business								
1-5	51(28.2)	130(71.8)	5.22	0.074	14(7.7)	167(92.3)	0.60	0.738
6-10	25(24.5)	77(75.5)			6(5.9)	96(94.1)		
>10	44(37.9)	72(62.1)			10(8.6)	106(91.4)		

Association between respondents' socio-demographic characteristics and level of food hygiene practice among food vendors

There was a significant association between age and the level of observed practice of food hygiene (P=0.041). The educational level was also significantly associated with food hygiene practice (P=0.041) (Table 6).

Table 6: Association between socio-demographic characteristics of respondents and level of observed practice of food hygiene among food vendors.

Variable	Level of Practice of Food Hygiene		Total	χ2	P value
Age (years)	**Poor**	**Good**			
<=20	12(75.0)	4(25.0)	16(100)	20.92	**0.000**
21-30	16(25.4)	47(74.6)	63(100)		
31-40	68(28.8)	168(71.2)	236(100)		
41-50	28(43.1)	37(56.9)	65(100)		
51-60	9(47.4)	10(52.6)	19(100)		
Gender					
Male	15(40.5)	22(59.5)	37(100)	0.95	0.329
Female	118(32.6)	244(67.4)	362(100)		
Marital Status					
Married	91(32.2)	192(67.8)	283(100)	0.64	0.726
Single	40(36.0)	71(64.0)	111(100)		
Divorced/separated	2(40.0)	3(60.0)	5(100)		
Level of education					
No formal education	33(58.9)	23(41.1)	56(100)	36.39	**0.000**
Primary	7(20.0)	28(80.0)	35(100)		
Secondary	91(34.6)	172(65.4)	263(100)		
Tertiary	2(4.4)	43(95.6)	45(100)		
Owner					
Yes	106(31.8)	227(68.2)	333(100)	2.04	0.153
No	27(40.9)	39(59.1)	66(100)		
Years in food business					
1-5	61(33.7)	120(66.3)	181(100)	0.62	0.734
6-10	31(30.4)	71(69.6)	102(100)		
>10	41(35.3)	75(64.7)	116(100)		

DISCUSSION

The respondents mean age in this study was 34.9 ± 8.5 years, and the highest age proportion (59.1%) falls within the age group of 31-40 years. The distribution of females (90.7%) and males (9.3%) follow the pattern of the population distribution by gender in Ghana[17] and Lagos[18] but opposes the study done in Iran with male dominance of 87.4% and Qatar (100%).[19] This could relate to the dominant position of women in the food industry, along with cooking and food trades being predominant jobs for them and could also be ascribed to the old cultural practices of educating the male child at the expense of their female child. Also, most respondents' highest level of education was secondary level (65.9%). This contrasts with a study done in India,[20] but similar studies in Akure.[6] This implies that most food vendors belong to the socio-economic group and lack the readiness to pursue higher education due to

social deprivation caused by poverty. Also, the low level (11.3%) of participation of university graduates in this study might be due to increased employability in the formal sector. Furthermore, this study shows that 58.6% of respondents had received food hygiene training, indicating the readiness to curtail foodborne diseases. Those with no formal training (41.4%) were found to sell their food in an unclean environment. Findings are consistent with the study conducted in Iran[21] but differ from those done in Nasarawa, with 70.3% of respondents lacking food hygiene training.[11]

The majority (95.5%) of respondents are aware that consuming contaminated food may result in major health problems for an individual, 59.9% were aware that germs cause cholera, and 91.0% knew rodents and insects could transmit food poisoning. This finding is similar to the study carried out in Calabar Municipal, Cross River, where 79% of food vendors knew that there is a link between food and disease[10] and in Kenya, 93.6% knew cholera could be caused by germs in food. Rats and cockroaches could transmit food poisoning (82.6%).[22] The degree of awareness of food hygiene among these street food vendors could be due to the food hygiene training received.

A high proportion of respondents in this study had good knowledge of hand hygiene, which could translate to the fact that they are well knowledgeable of the dangers that foodborne diseases can cause due to improper hand washing. The findings are consistent with a study conducted in Chitwan Nepal (94.7%)[23] and Osun state (55.6%).[24] Hand hygiene is a critical component of infection prevention and control. When handling food, 91.2% of respondents knew they should cut their nails short, and 81.2% knew they shouldn't wear jewellery to ensure food hygiene. This is like a study in Calabar.[25] Under the nails, bacteria can hide. Additionally, since ladies like to keep fingernails long and paint them, food contamination is inevitable. Therefore, we recommend that people who handle food should clip their nails. Also, in this study, 89.5% knew they should cover any cuts or wounds on their bodies. The key contaminant of uncovered cuts and sores is Staphylococcus aureus, which has an incubation period of 0.5-8 hours and when the bodily fluids and bacteria encounter food, it can lead to nausea, vomiting, abdominal cramps and diarrhea. This study is similar to the study conducted in Zambia.[26] In this study, 45.6% of the respondents had good knowledge about wearing gloves to ensure good hygiene. This contradicts the findings found in Dubai (75.5%)[34] and Sudan (90%)[24]. Gloves protect food from contaminants that can inadvertently permeate the food from skin, hands, and fingernails. The reason for this difference could be that almost all food vendors in the study in Dubai and Sudan had regular training on food hygiene with consistent updates on the emphasis of the use of gloves to increase the standard of food hygiene compared to this study, which had a good amount of training but may not be too regular and with less emphasis. Furthermore, this study shows that most (90.2%) respondents knew that the same cutting board and knives shouldn't be used to handle raw meat and cooked food. This agrees with the study in Calabar municipal, Cross River (96.8%)[2] but differ from the study in Sokoto (35%).[15] The low turnout of respondents in Sokoto has shown that they don't have good knowledge about the dangers of using the same cutting board and knives for raw and cooked food, which may be due to a lack of training. Despite the good knowledge gained on the prevention of cross-contamination and safe preservation of food through training in this study, there is still a need for the WHO's five keys to safer food posters to be placed in strategic positions to continually remind them of grey areas they may need to perfect on food hygiene management.

Many (91.7%) street food vendors agreed that food handlers must receive training in food hygiene. This study agrees with a study conducted in Dubai (82.4%),[27] but differs from a study conducted in Calabar where 34.6% of the respondents agreed on the importance of food hygiene training.[10] The perception of the food vendors in Calabar concerning training of food vendors may be due to the informal setting received in their homes, as they do not regard training as a prerequisite for proper food hygiene. Most of this study (98.5%) also agreed that hand washing should be done multiple times while food is being prepared. This study is like a systematic review, which shows that 89.6% agreed that hand washing should be done before food preparation.[28] Food handlers carry bacteria in their hands, acting as a source of food contamination in food establishments. Hence, we must wash our hands before and after preparing food every time. Many (98.2%) in this study agreed that cooking utensils and wiping towels should be washed with soap, water, and sanitiser. This study agrees with the study conducted in Ogun state.[6] Consumers' health depends on clean dishes and cooking equipment. Cockroaches, mice, and other pests may be drawn to dirty dishes, used cooking utensils and left-over food. Significant numbers (92.7%) of respondents agreed that checking the refrigerator's temperature daily is important to ensure safe food storage. This agrees with the study carried out in Ethiopia (95.5%).26 but differs from a study carried out in Uganda (44.4%).[29]

Hand washing during food preparation was practised by many respondents (81.5%). The result is consistent with a study conducted in Ethiopia (84.2%).[30] but this is in sharp contrast to the Sri Lanka study, which had unsatisfactory reports (11.5%).[31] Consistent hand washing was practised by many respondents (82.7%) after using the toilet, like in the study in Malaysia (86.8%).[32] This study had an appreciable number of respondents with good personal and environmental hygiene practices. This practice differs from a study in Zimbabwe.[33] This study shows that 80.7% reheat their food before serving, which contrasts with the study conducted in Owerri.[34]

Respondents' overall self-reported practice level on food hygiene shows that 67% had good practice while 33% had poor practice. This is consistent with the study conducted in Cross River State, which found good practice (86%) and poor practice (14%). Also, similar findings were found in Kenya (86.3%±8.3%).[22] This is contrary to a study conducted in Addis Ababa, Ethiopia, where reported good practices were found to be 48.8%,[35] and Gondor, Northwest Ethiopia (46.7%).[36]

The rating of the observed practice revealed that 58% of the street food vendors had poor food hygiene practices. This study supports the findings in Ethiopia with observed poor practices (65.5%),[35] but does not support the findings found in Calabar municipal, Crossriver, where 54.8% had observed good practices.[10] This observation in this study does not support the findings from the food vendors self-reported practice, rated as good. However, this proportion of poor observed practice could significantly impact the etiology of foodborne diseases.

This study shows a significant positive association between the level of education and food hygiene knowledge (P=0.028). This agrees with the study conducted in Ghana.[17] but in contrast with the study done in Enugu.[37] In this study, gender shows a significant positive association with attitude (P=0.000) as more females had a positive attitude towards food hygiene, which also influenced their educational status (P=0.035). This study differs in India,[34]but agrees with a study conducted in Dodoma, Tanzania.[38]

This study shows a significant association between age and food hygiene observed practice (P=0.041), and educational status also shows a significant association with observed practice (P=0041). This is similar to the study conducted in Owerri,[34] but differs from that conducted in Enugu,[37] and Vientiane, Laos.[16] This tells that age significantly influences the practice of food hygiene. The higher the age, the higher the chance of engaging in good hygiene practice, and the higher the level of education attained, the more knowledge they have gained to engage in good hygiene practice. In other words, age and education predicted the food hygiene practices of respondents.

The findings in this study suggest that the knowledge, attitude and reported practice of food hygiene was good, but the observed practice was poor. This implies that there is a high risk of contracting foodborne diseases that can pose an increase in morbidity and mortality among customers. However, with training and retraining of these food vendors, they can adhere and pay attention to every detail, thereby improving the food hygiene standard. Food contamination can be curtailed with regular environmental inspection by the committees, emphasising areas where food vendors do not think it is necessary to maintain a food hygiene standard.

CONCLUSION

Despite the good knowledge and attitude observed, food hygiene practices were poor among the food vendors. Increased food hygiene education should be the focus of public health interventions for street food vendors and investigations into the channels via which improved knowledge might be translated into food hygiene practices that will reduce foodborne disease. WHO's five keys to safer food posters should be placed strategically by the state government where every food vendor can see them.

Study limitations, strengths, and recommendations for further investigation

This cross-sectional observational study design used for this study could not ascertain causality, unlike a longitudinal study design, which would have obtained strengthened inferences of causality.

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REFERENCES

1. Wu G, Yuan Q, Wang L, Zhao J, Chu Z, Zhang Y, Wang K, Xian P, Liu Y, Du Z. Epidemiology of Foodborne Disease Outbreaks from 2011 to 2016 in Shandong province, China. Medicine (Baltimore), 2018; 97(45).
2. Timileyin E, Goshen D, Irenosen A, Elizabeth F, Temidayo O, Adegboyega J, Olayemi C, Samuel I, Elohozino O. Most prominent factors of food poisoning in Africa: Nigeria Based Perspective. IPS Journal of Nutrition and Food Science, 2022; 1(1): 11-17.
3. Malvern K, Hosea L, Chibale C. Factors Affecting Food Hygiene Practice in Rural Restaurants: A Case of Kawambwa District. International Journal of Humanities, Social Sciences and Education, 2022; 9(31-52).
4. Akindele S, Bilesanmi A. Food Handling and Waste Management Practices Among Food Vendors in Ijebu North Local Government, Ogun State, Southwest Nigeria. International Journal of Women in Technical Education and Employment. The Federal Polytechnic, Ilaro Chapter, 2021; 2(1): 1-10.
5. Regina L. Approach to The Adult with Acute Diarrheal in Resource-Limited Countries, 2023.
6. Christiana E, Akinduosoye A, Samuel I. Socio-Demographic Characteristics and Food Hygiene Level Assessment of Food Handlers in Cafeterias Around a Federal University in Nigeria. Journal of Scientific Research and Report, 2017; 14(4): 1-9.

7. Balarabe A, Musa Y, Malami M, Abdauaziz M. Knowledge and Practice of Food Hygiene Among Food Vendors in Selected Primary Schools within Sokoto Metropolis. International Journal of Tropical Disease and Health, 2021; 42(9): 13-26.
8. Samuel E, Chidiebere F, Ugochi R. Foodborne Diseases and Intoxication in Nigeria: Prevalence of Escherichia Coli 0157: H7, Salmonella, Shigella and Staphylococcus Aureus. Journal of Advances in Microbiology, 2020; 20(12): 84-94.
9. Nagham M, Muhsin M, Anaam J. Review on Food poisoning (Types, Causes, Symptoms, Diagnosis, Treatment): Global Academic Journal of Pharmacy and Drug Research, 2021; 3(4): 54-61.
10. Ruth E, Aniekanabasi J, Simon A, Olajumoke E, Elizabeth L. Food Hygiene Knowledge, Attitude and Practices among Food Handlers in Calabar Municipal, Cross River State, Nigeria. World Journal of Advanced Research and Review, 2022; 16(01): 088-101.
11. Patricia A, Carla N, Luisa P. Food-to-Humans Bacterial Transmission. America Society for Microbiology, 2020; 8(1): 0019-2016.
12. Yusuf T, Chege P. Awareness of Food Hygiene Practices and Practices Among Street Food Vendors in Nasarawa State, Nigeria. Int J Health Sci Res, 2019; 9(7).
13. Mosa S, Joanne M. Assessment of Food Hygiene Knowledge and Practice among Food Handlers in Selected Hotels around Umhlathuze Area. African Journal of Hospitality, Tourism and Leisure, 2018; 7(4).
14. Anthony C, Kenechi A, Chukwuma B, Kevin C, Henry N. Knowledge, Attitude and Practices of food hygiene among food vendors in Owerri, Imo state, Nigeria. Occupational Diseases and Environmental Medicine, 2017; 5: 11-25.
15. Ismail R, Oche M, Kaoje A, Yahaya M. WHO Five Keys to Safer Food Handling: Knowledge and Practice among food handlers in Sokoto Metropolis, Sokoto, Nigeria. International Journal of Tropical Disease and Health, 2021; 42(7): 32-42.
16. Ngoe Q, Sengchanh K. Knowledge, Practice and Related Factors of Food Hygiene among Street Food Vendors in Vientiane Capital Laos: Hanoi University of Public Health. April, 2019.
17. George E, Mavis P, Joyce D. Hygiene Practices Among Food Vendors in Hohoe Township. Central African Journal of Public Health, 2016; 2(2): 43-50.
18. Ifebayo A, Eboh J. Assessment of Food Hygiene Practices among Vendors in Tertiary Institution in Lagos Mainland. International Journal of Research in Education and Sustainable Development, 2021; 1(11).
19. Hammad A, Israa E, Ipek G. Assessing Safe Food Handling Knowledge and Practices of Food Service Managers in Doha, Qatar: Food Science and Technology International, 2019; 0(0): 1-9.
20. Deepita N, Malangori A, Susmita B. Knowledge, Attitude and Practice Regarding Food Hygiene Among Food Handlers of Eating Establishment of a Medical College, Pune, Maharsahtra: A Cross-Sectional Study, 2022.
21. Razeghi F, Jahed K, Nedjah S, Haghi E, Yunesian M. Knowledge, Attitude, And Practice Among Food Handlers of Semi-Industrial Catering: A Cross-Sectional Study at One Of The Governmental Organization In Tehran. Journal Of Environmental Health Science and Engineering, 2018; 16(2): 249-256.
22. Michael M, Grace W. Food Hygiene Knowledge, Attitude and Practice Among Food Handlers in Selected Hotels and Restaurants in Thika Town. International Journal of Creative Research Thought, 2020; 8(7): 2320-2882.
23. Gayatri K, Niki S, Sarbada S, Shakuntala C. Food Hygiene Management among Food Handlers of Chitwan Nepal- Pre-Post Study Design, 2022.
24. Asekun O, Igbokwe C. Assessment of Attitudes Towards and Practice of Food Hygiene Among Babcock University Cafeterias Workers: South American Journal of Public Health, 2016.
25. Easter C, Hannah T. Appraisal of Knowledge and Practice of Food Hygiene among Food Vendors in University of Calabar, Calabar, Nigeria. Global Journal of Pure and Applied Sciences, 2022; 28: 185-191.
26. Duncan M, Kevin C, Chitundu K. The Evaluation of Food Hygiene Knowledge, Attitudes and Practices of Food Handlers in Food Service Establishments in a Peri-Urban Municipality of Zambia. The International Journal of Multi-Disciplinary Research, 2017.
27. Suwaidi A, Hussein H, Faisal W, Sawaf E, Wasfy A. Hygienic Practices Among Food Handlers in Dubia: International Journal of Preventive Medicine Research, 2015; 1(3): 101-108.
28. Kholis E, Qatrrunada N, Anis M, Muhammad H, Tri E, Fathul J, Dini W, Yusnita. Relationship of knowledge and attitude with food handling practices. A systematic review. International Journal of Public Health Sciences, 2021; 10(2): 336-347.
29. Sylvia A, Roseann M, John B. Hygiene Practices and Food Contamination in Managed Food Service Facilities in Uganda: African Journal Of Food Sciences, 2015; 9(1): 31-42.
30. Fresenbet F, Meseret A, Kifle H, Hanna S, Aweke K. Determinants of Safe Food Handling Practice among Food Handlers in Food Establishments, Yeka Sub City, Addis Abba, Ethiopia. National Library of Medicine, 2023; 9(1).
31. Lahiru S, Devika I, Samath D. Knowledge and practices of food hygiene among food handlers in plantation sector, Sri Lanka. International Journal of Scientific Reports, 2016; 2(12): 304-311.
32. Aimi M, Nor A, Mainul H. Knowledge, Attitude and Practice toward Food Poisoning Among Food Handlers and Dieticians Students in a Public University in Malaysia. National Library of Medicine, 2018; 10(4): 232-239.

33. Thabani N, Bonga W. Hygiene Practice of Street Food Vendors in Zimbabwe: A Case of Harare. Journal Of Economics and Finance, 2019; 4(3): 23-34.
34. Okoroafor I, Ibe S, Nwanya E, Oyamienlen C. Knowledge and Practice of Food Hygiene Among Food Vendors in Ihiagwa, Owerri West Local Government Area, Imo State. Texila International Journal of Public Health, 2019; 7(2): 2520-3134.
35. Ahmed M, Abdella A, Abadir A, Mulusew G, Sabit A, Abera K. Food Hygiene Practices and Associated Factors Among Food Handlers Working in Food Establishments in The Bole Sub City, Addis Ababa, Ethiopia: National library of medicine, 2020; 13: 1861-1868.
36. Lema K, Abuhay N, Kindle W, Dagne H, Guade T. Food Hygiene Practice and Its Determinants Among Food Handlers At University of Gondor, Northwest Ethiopia: International Journal of General Medicine, 2020; 13: 1129-1137.
37. Amelia N, Samuel C. Food Hygiene Knowledge and Practice Among Food Handlers In University Of Nigeria, Nsukka Campus: Mediterranean Journal Of Social Sciences, 2018; 9(6): 137-144.
38. Zalia B, Theresia J, Kissa K. Perception and Attitudes of Street Food Vendors Towards The Healthiness of Meals Prepared and Sold in Dodoma: Food Science and Nutrition, 2023; 11: 3885-3897.