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Food hygiene knowledge, attitude, and practices of local food vendors in Obio Akpor Local Government Area of Rivers State

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Abstract

Background: Globally, local food vendors provide a source of convenient and inexpensive food for the teeming population on daily basis and they play an important role in food hygiene and safety. The breakdown of food hygiene during food preparation presents the subsequent risk of the emergence of food borne illnesses along the pathway of the entire food supply chain leading to morbidity and mortality of consumers.

Objective: The aim of this study is to assess hygiene knowledge, attitude, and practices of local food vendors in Obio/Akpor Local Government Area (LGA) of Rivers State.

Methods: This study is a descriptive cross-sectional study. The sample size calculated to be 422 using Cochran formula and a multi-stage sampling technique was employed to recruit the study participant. A pretested interviewer-administered questionnaire was used to collect data. Data generated was analysed using version 26 of SPSS.

Results: Among study participants, 84.1% were females and 15.9% males. 90.8% and 94.1% of the respondents had good food hygiene knowledge and attitude respectively. This study showed a proportion of food vendors who practiced good hygiene to be 34.6%. A significant relationship exists between knowledge of food hygiene and sex (p=0.002) and, education level (p=0.007).

Conclusion: This study showed that majority of the food vendors have good food hygiene knowledge and attitude but only one third of the respondents had good hygiene practices. Therefore, food vendors should be periodically trained and supervised to ensure good hygiene practices.

Keywords: Food Hygiene; Knowledge; Attitude; Practices; Local Food Vendors; Obio Akpor LGA

1. Introduction

One of the elemental requirements for life is food, and is consumed by organisms to provide nutritional support, which might be either plant, animal, or fungi origin. However, its handling, preparation, production, and consumption have its own fundamental part to play in life sustenance [1] The growth in urbanization and globalization has led to consumption of food away from home coupled with the involvement of women in business, politics, and career, to increase the family income. This addition to the responsibilities of women has created opportunity in food vending, operated mostly by women. Since the 1970s, out-of-home feeding has absorbed 26% of the household food expenditure and 44% in 2014 [2]. Many developing countries, Nigeria inclusive have local food vendors as a fundamental component of the food web due to the advent of urbanization [3]. In Nigeria, urban city residents "spend as much as half of their food expenditure" on local food vended in the streets and public places, usually called street foods [4].

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Local food vendors are people who prepare and sell ready-to-eat foods on the streets, along the roadsides and diverse common places such as markets usually in an inappropriate structure such as stalls, kiosks, pushcarts and under shades such as trees and umbrellas. They are mostly referred to as street food sellers. Food vendors prepare and sell ready- to-eat foods including drinks and juices on the boulevard and common places to customers to be consumed instantly and sometimes in takeaway plates or bags or nylon to be consumed at a convenient time [5]. It is estimated that 2.5 billion people worldwide consume foods from local food vendors on daily basis [7] despite the benefits, it is unhealthy to consumers when not properly handled, prepared, or served hygienically.

The slogan "Farm to Plate, make Food Safe" [7], focuses on the need to address globally in an interdependent manner, the hidden menace posed by contaminated food which is an aftereffect of the disintegration of food hygiene practices from food production to consumption which leads to the emergency of food borne diseases as the resultant risk, of which a critical component is the food vendor [8].

Food borne diseases have become a global health burden and of special concern in developing nations because of increase in out-of-home feeding [9]. An estimate of 200 diseases, stretching from diarrhea to cancer emanated due to unhygienic food containing harmful pathogens and/ or chemical substances. This has further resulted in 33 years of disability-adjusted life years (DALYs) due to 600 million people which is equivalent to 1 in 10 people globally becoming ill after eating foods laden with harmful pathogens and 420,000 dying every year [10]. Food borne diseases have become a burden borne by persons of all age brackets, especially under-5 children with 125,000 dying yearly, which represents 40% of the food borne illness stress and by individuals who reside in developing or third world nations [10]. The highest burden per populace of food borne illnesses is bore by Africans, with appreciable disparities between regions in the world [8].

In Nigeria, a Sub-Saharan Africa country, food safety remains a challenging concern which has been aggravated by the government inability to coordinate and control food safety activities through lack of implementation of food safety laws and enactment, provision of social amenities and unawareness of the general public with regards to food hygiene, despite the attempts made by the authorities through the National Agency for Food and Drug Administration and Control (NAFDAC) to enhance food supply chain safety [11].

Food can be contaminated at any point across the farm to table pathway or food chain as a result, food hygiene management is a burden shared by all components in the food supply chain, from production to consumption. The production and serving of wholesome food to consumers is guaranteed by each component operating responsibly. Hitherto, food vendors and food handlers in the public or at home has contributed largely to the magnitude of food borne illnesses due to improper handling and preparation. Some food handlers and consumers lack the basic knowledge required for buying, preparation, preserving and serving of wholesome food for the health benefit of the community as a whole and theirs as well.

In reducing effectively, the threat posed by food borne diseases, local food vendors play an important role since they are in correspondence with consumers [8]. The development of properly effective, integrated, preventive and coordinated strategies in agreement with the WHO "Five Keys to Safer Food" (which include: "keep clean; separate raw and cooked; cook thoroughly; keep food at safe temperature and; use safe water and raw materials") is facilitated through the assessment of hygiene practices of local food vendors as they are buying, preparing, storing and serving foods to the customers, and applying appropriate intervention through food hygiene education/training with the intention of decreasing contamination risk [7].

The World Health Organization report [10], states that diseases that are food borne have been a demanding threat to all nations since the existence of man and 550 million people are estimated to become ill and 230,000 people die yearly due to diarrheal diseases associated with ingestion of microorganism contaminated foods. The World Bank [12] in a publication reported that, the overall productivity lost due to food borne illnesses per year is estimated to cost $95.2 billion annually, and the amount spent in treating food borne illnesses per year is estimated at $15 billion.

Asians in the Southeast region and African nations were shown to have the greatest burden of food borne diseases when compared to countries in other continents [13]. A study conducted in China by Ma et al., [14], revealed poor knowledge, negative attitudes towards food hygiene and poor practices of food hygiene among the local food vendors. In developing countries, about 110 billion US dollars is spent annually on hospital treatment of food-related illness [15]. In Africa, an estimate of 91 million individuals fall sick causing 137,000 people to die yearly due to consumption of contaminated and unsafe food [10].

The Food and Agricultural Organization report [16] states that about 2.5 million people are known to eat food procured from food vendors and are faced with food borne diseases leading to death as a result of poor handling and preparation of foods. In Nigeria, with the increase of out-of-home feeding as a result of the harsh economy, the prevalence of food borne diseases is on the increase despite the government and non-governmental organization effort to curb the menace of food borne pathogens [17]. The continuous spread of food borne disease has been linked to personal hygiene, environmental sanitation and food hygiene practices in many homes and communities [9]. It is a familiar to see food vendors in our streets and public places use make-shift structures, pushcarts, kiosks etc. preparing and selling foods for their customers. It is notable that countless food vendors lack the basic equipment and infrastructure to cook, preserve and serve these foods in the right temperature and condition giving rise to microbial contamination. Also, it is usual to see 25 litres gallon for water as they lack running water source to cook and wash up utensils properly leading to the use of bowls of water for washing of hands, plates, and cutleries.

The aim of this study is to assess food hygiene knowledge, attitude, and practices of local food vendors in Obio/Akpor LGA. It tests the following hypothesis:

- Ho: there is no significant relationship between knowledge of food hygiene and attitude of local food vendors in Obio/Akpor LGA?
- Ha: there is a significant relationship between knowledge of food hygiene and attitude of local food vendors in Obio/Akpor LGA?

2. Materials and method

2.1. Study Design

This research is a descriptive cross-sectional study of food hygiene knowledge, attitude and practices of local food vendors in Obio-Akpor LGA of Rivers State.

2.2. Study Population

The study population comprises of all local food vendors who sell cooked food which include food kiosks, roadside food sellers, street food seller, food sellers using make-shift structures and pushcarts whose business site is within Obio-Akpor LGA, of Rivers State.

2.3. Sample Size

The Cochran [18] formula ($n = Z^2pq/e^2$) was used in determining the minimum sample size, which is 424 food vendors.

2.4. Sampling Technique

This study used the multi-stage sampling method which is a probability sampling technique to recruit food vendors consenting to the research across the 17 wards in Obio/Akpor LGA of Rivers State, using a step-by-step approach.

2.4.1. Study Instruments and Tools

A structured, pre-tested interviewer administered questionnaire with closed-ended questions was used for the collection of data to assess the socio-demographics information, level of food hygiene knowledge, attitudes, and practices of local food vendors.

2.4.2. Data Entry and Analysis Plan

The data generated was collated, sorted and cleaned using Microsoft Excel sheet version 2016. Then the cleaned data was exported and analysed using version 26 Statistical Package for Social Sciences (SPSS).

The continuous variables were summarized using mean and standard deviation, while the categorical variables were summarized using frequency and percentages. Also, Chi square test was used to determine the association between the categorical variables.

3. Results

Table 1 Social demographic Data

Variable	Frequency n=422	Percent (%)
Age group		
18-25	15	3.6
26-35	147	34.8
36-45	195	46.2
>45	65	15.4
Sex		
Female	355	84.1
Male	67	15.9
Marital status		
Single	73	17.3
Married	314	74.4
Divorced	6	1.4
Widowed	27	6.4
Others	2	0.5
Education		
No formal education	6	1.4
Vocational	36	8.5
Primary	18	4.3
Secondary	269	63.7
Tertiary	93	22
Religion		
Christian	402	95.3
Islam	20	4.7
Vendor		
Stationary	422	100.0
Yrs. Of Exp.		
<5 years	95	22.5
6-10 years	230	54.5
11-15 years	69	16.4
16-20 years	18	4.3
> 20 years	10	2.4
License to operate		
Yes	28	6.6
No	394	93.4

The table 1 shows that 15(3.6%) of the respondents were between the ages of 18-25 years, 147(34.8%) were between the ages of 26-35 years, 195(46.2%) were between the age of 35-45 years and 65(15.4%) were >45years. Females were 355(84.1%) and males were 67(15.9%). Assessing the respondents' educational status, 6(1.4%) had no formal education, 36(8.5%) had vocational education, 18(4.3%) had primary education, 269(63.7%) had secondary education and, 93(22%) had tertiary education.

Findings among the respondents revealed that 230(54.5%) had between 6-10 years' experience, 394(93.4%) had no license to operate.

Table 2 a Knowledge of Food Hygiene (KFH)

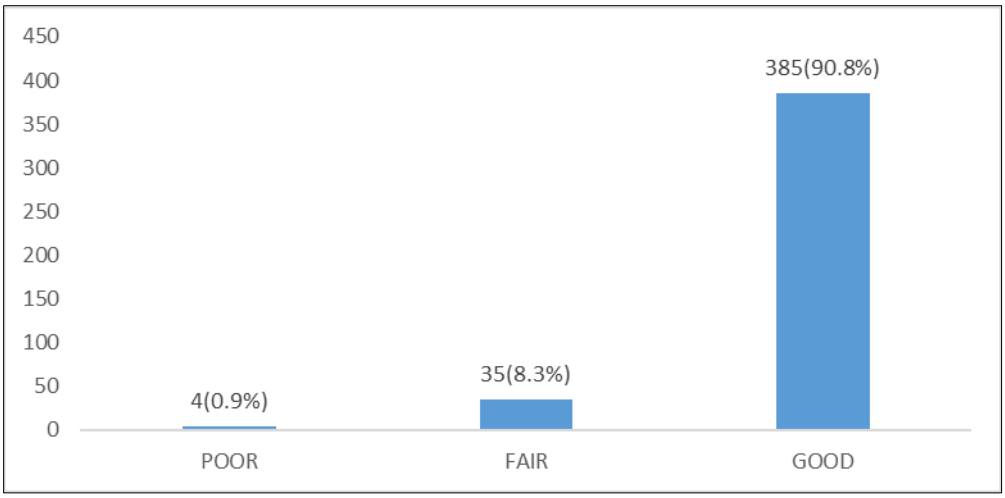
Variable	**Frequency n=422**	**Percent (%)**
Had training		
Yes	56	13.3
No	364	86.3
I don't know	2	0.5
Washing hand properly can prevent food borne disease		
Yes	420	99.5
No	2	0.5
Food handlers are source of food borne outbreaks		
Yes	329	78.0
No	79	18.7
I don't know	14	3.3
Food vendors with cut in hands should not touch food without gloves		
Yes	394	93.4
No	14	3.3
I don't know	14	3.3
Cross contamination is the transfer of harmful substance to food from food/contact surface		
Yes	361	85.5
No	2	0.5
I don't know	59	14
Paper/Polythene packs are unsafe for food packaging		
Yes	200	47.4
No	186	44.1
I don't know	36	8.5
Raw and cook foods should be stored separately		
Yes	412	97.6
No	6	1.4
I don't know	4	0.9

Table 2a shows that 56(13.3%) of the respondents had training on food hygiene, 364 (86.3%) have had no training while 2(0.5%) do not know if they have had any training on food hygiene. In assessing the respondents' knowledge on food borne diseases, 420(99.5%) reported that proper washing of food can prevent food borne disease and 329(78.0%) reported that food handlers can be a source of food borne outbreaks.

Table 2 b Knowledge of food hygiene (KFH)

Variable	Frequency n=422	Percent (%)
Clean food can prevent diarrhea		
Yes	416	98.6
No	2	0.5
I don't know	4	0.9
Raw food should be washed twice or more		
Yes	414	98.1
No	8	1.9
Oil should be used severally		
Yes	44	10.4
No	338	80.1
I don't know	40	9.5
Reheating cooked foods can contribute to food poisoning		
Yes	71	16.8
No	323	76.5
I don't know	28	6.6
Need to carefully select raw materials		
Yes	420	99.5
I don't know	2	0.5
Safe food handling is important aspect		
Yes	419	99.3
No	3	0.7
Food vendors should have coloured nails		
No	418	99.1
I don't know	4	0.9
Mean Knowledge Score	78.7±8.5	

Table 2b shows that 416(98.6%) of the respondents reported that clean food can prevent diarrhea, 44(10.4%) food vendors reported that oil can be reused severally, 338(80.1%) thinks oil should not be reused severally and 40(9.5%) are not sure if oil should be reused severally or not. Among the respondents, 323(76.5%) thinks that reheating cooked food cannot contribute to food poisoning,



Poor 0-49.9%, fair: 50-69.9%, Good: 70-100%

Figure 1 Level of Knowledge of Food Hygiene

Figure 1 shows that 90.8%, 8.3% and 0.9% of the respondents have good, fair and poor knowledge of food hygiene respectively.

Table 3 a Food Hygiene Attitude (FHA)

Variable	Frequency (n=422)	Percent (%)
Safe food handling is important		
Agree	419	99.3
Don't know	3	0.7
Good personal hygiene prevents food borne disease		
Agree	417	98.8
Disagree	2	0.5
Don't know	3	0.7
Producing safe food is more important than tasty food		
Agree	404	95.7
Disagree	16	3.8
Don't know	2	0.5
Food borne illness has negative effect		
Agree	393	93.1
Don't know	29	6.9
Food hygiene training is important		
Agree	400	94.8
Disagree	4	0.9
Don't know	18	4.3
Closed can/jar of cleaning product can be stored with food items		
Agree	16	3.8
Disagree	396	93.8

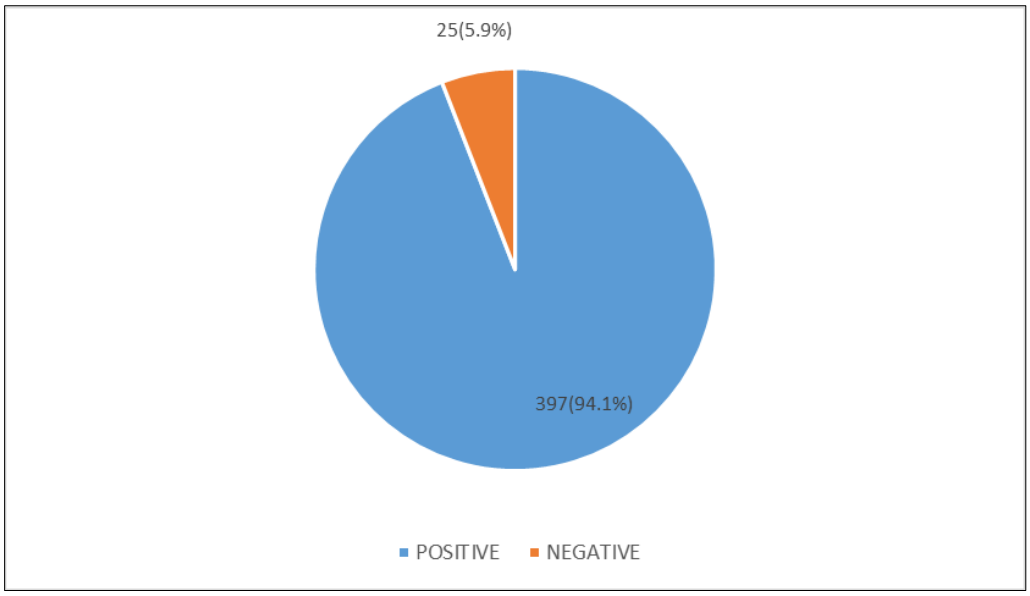
Don't know	10	2.4
Defrosted food should be refrozen		
Agree	252	59.7
Disagree	135	32
Don't know	35	8.3
Well cooked foods are free of contamination		
Agree	342	81.0
Disagree	78	18.5
Don't know	2	0.5

In table 3a, 419(99.3%) of the respondents agree that safe food handling is an important part of their job responsibility and 417(98.8%) agree that good personal hygiene prevents food borne illness. 393(93.1%) of the respondents reported, agrees that food borne illness have negative health effect and 400(94.8%) of the respondents agreed that food hygiene training is important, Findings revealed that, 252(59.7%) respondents agree that defrosted food should be refrozen.

Table 3 b Food Hygiene Attitude (FHA)

Variable	**Frequency (n=422)**	**Percent (%)**
Health status of food handlers should be evaluated before employment		
Agree	404	95.7
Disagree	2	0.5
Don't know	16	3.8
Protective clothing reduces the risk of food contamination		
Agree	332	78.7
Disagree	47	11.1
Don't know	43	10.2
Eggs must be washed after purchase		
Agree	169	40.0
Disagree	241	57.1
Don't know	12	2.8
Mean Attitude Score	84.6±10.7	

Table 3b shows that among the respondents 404(95.7%) agreed that health status of food handlers should be assessed before employment, and 332(78.7%) agreed that protective clothing reduces the risk of food contamination. Furthermore, 169(40.0%) respondents agree that eggs must be washed after purchase, 241(57.1%) disagrees and 12(2.8%) does not know if eggs must be washed after purchase or not.



Negative 0-69.9%, Positive: 70-100%

Figure 2 Level of Food Hygiene Attitude

The result shows that 397(94.1%) had positive attitude and 25(5.9%) had negative attitudes towards food hygiene.

Table 4 a Food Hygiene Practices (FHP)

Variable	Frequency n=422	Percent (%)
Touching body part		
Always	190	45.0
Sometimes	232	55.0
Wear head cover		
Sometimes	367	87.0
Never	55	13.0
Repeatedly heat left over foods		
Always	18	4.3
Sometimes	230	54.5
Never	174	41.2
Wash hands before cooking		
Always	402	95.3
Sometimes	20	4.7
Wash hands after blowing nose/sneezing		
Always	286	67.8
Sometimes	134	31.8
Never	2	0.5
Wash hands after handling raw food		
Always	279	66.1

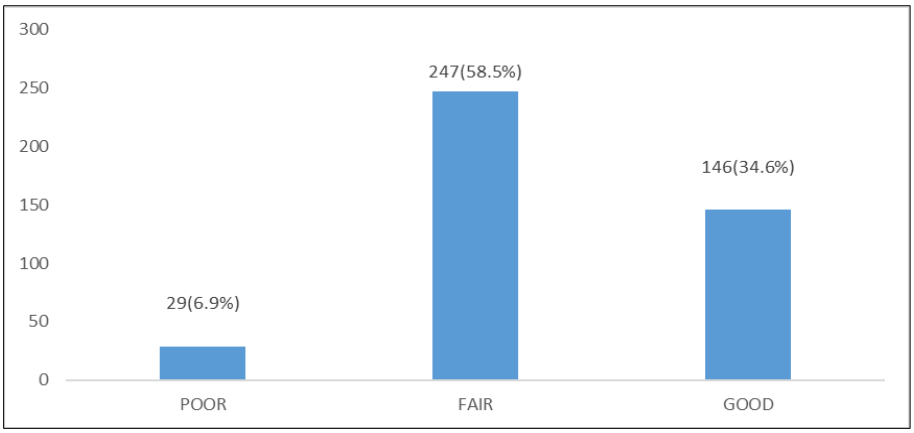
Sometimes	143	33.9
Chew or talk while serving food		
Always	36	8.5
Sometimes	287	68.0
Never	99	23.5
Wear apron		
Sometimes	347	82.2
Never	75	17.8
Wear nose mask/hand gloves		
Sometimes	62	14.7
Never	360	85.3

The result in table 4.4a shows 190(45.0%) of the respondents always avoid touching their body part when cooking, 367(87.0%) sometimes wear head cover and, 347(82.2%) sometimes wear apron during food handling, while 360(85.3%) never wear nose mask or hand gloves during food handling. Also, 230(54.5%) respondents sometimes repeatedly heat left over foods and, 287(68%) sometimes chew/talk while serving foods.

Table 4 b Food Hygiene Practice (FHP)

Variable	**Frequency n=422**	**Percent (%)**
Properly clean food storage area		
Sometimes	422	100.0
Still cook when sick		
Sometimes	82	19.4
Never	340	80.6
Buy clean and fresh food		
Always	418	99.1
Sometimes	4	0.9
Wash food with disinfectant		
Always	250	59.2
Sometimes	59	14
Never	113	26.8
Carry out periodic examination		
Always	42	10
Sometimes	230	54.5
Never	150	35.5
Mean Practice Score	64.1±9.9	

Findings in table 4.4b shows that 422(100.0%) of the respondents sometimes properly clean food storage area, 418(99.1%) always buy clean and fresh food and, 113(26.8%) never wash their food items with disinfectant. Among the respondents, 82(19.4%) sometimes still cook when they are sick and, 42(10%) always carry out periodic medical examination.



Poor 0-49.9%, fair: 50-69.9%, Good: 70-100%

Figure 3 Level of food hygiene practices among local food vendors

The result shown in figure 4.4 reveals that 29(6.9%) of the respondents had poor practice, 247(58.5%) had fair practice, 146(34.6%) had good hygiene practices.

Table 5 Factors associated with knowledge of food hygiene

Variable	**Knowledge**		**OR (95% C.I.)**	**χ^2 (p<0.05)**
	Poor/Fair n (%)	**Good n (%)**		
Sex				
Female	26(7.3)	329(92.7)	0.3(0.2-0.7)	9.804(0.002) *
Male	13(19.4)	54(80.6)		
Age group				
≤35 years	17(10.5)	145(89.5)	1.3(0.7-2.5)	0.491(0.483)
>35 years	22(8.5)	238(91.5)		
Marital status				
Single/Divorced	9(8.3)	99(91.7)	0.9(0.4-1.9)	0.143(0.706)
Married	30(9.6)	284(90.4)		
Education				
≤ Secondary education	37(11.2)	292(88.8)	5.8(1.4-24.4)	7.151(0.007) *
Tertiary education	2(2.2)	91(97.8)		
Yrs of Experience				
≤10 years	35(10.8)	290(89.2)	2.8(0.9-8.1)	3.933(0.047) *
>10 years	4(4.1)	93(95.9)		
Have license				
Yes	0(0.0)	28(100.0)	1.1(1.1-1.2)	3.054(0.081)
No	39(9.9)	355(90.1)		
Trained of food hygiene				
No	37(10.1)	329(89.9)	3.0(0.7-13.0)	2.475(0.116)
Yes	2(3.6)	54(96.4)		

Table 5 shows that there is a significant relationship between sex and knowledge of food hygiene (χ^2=9.804, p=0.002). Female local food vendors were 0.3 times more knowledgeable about food hygiene compared to male local food vendors (OR = 0.3; 95%Cl: 0.2-0.7). Also, the table showed a significant association between education level and knowledge of food hygiene (χ^2=7.151, p=0.007). Local food vendor who had tertiary education were 5.8 times more knowledgeable compared to those had secondary/primary/vocational/no education (OR = 5.8; 95%Cl: 1.4-24.4).

Table 6 Factors associated with the food hygiene attitude

Variable	**Attitude**		**OR (95% C.I.)**	**χ^2 (p<0.05)**
	Negative n (%)	**Positive n (%)**		
Sex				
Female	10(2.8)	345(97.2)	0.1(0.0-0.2)	38.736(<0.001) *
Male	15(22.4)	52(77.6)		
Age group				
≤35 years	15(9.3)	147(90.7)	2.6(1.1-5.8)	5.248(0.022) *
>35 years	10(3.8)	250(96.2)		
Marital status				
Single/Divorced	9(8.3)	99(91.7)	1.7(0.7-3.9)	1.512(0.219)
Married	16(5.1)	298(94.9)		
Education				
≤ Secondary education	25(7.6)	304(92.4)	0.9(0.8-0.9)	7.512(0.006) *
Tertiary education	0(0.0)	93(100.0)		
Years of Experience				
≤10 years	25(7.7)	300(92.3)	0.9(0.9-1.0)	7.931(0.005) *
>10 years	0(0.0)	97(100.0)		
Have license				
Yes	0(0.0)	28(100.0)	1.1(1.0-1.1)	1.889(0.169)
No	25(6.3)	369(93.7)		
Training on FH				
Yes	4(7.1)	52(92.9)	0.8(0.3-2.4)	0.172(0.678)
No	21(5.7)	345(94.3)		
Knowledge				
Poor/Fair	15(38.5)	24(61.5)	23.3(9.5-57.4)	81.628(<0.001) *
Good	10(2.6)	373(97.4)		

The results in table 6, shows that there is a statistically significant association between sex and food hygiene attitude (p<0.001). This implies that the female food vendors are more likely to express positive attitudes towards food hygiene (OR = 0.1; 95%Cl: 0.0-0.2). Additionally, an association between knowledge and attitude of food hygiene was statistically significant (p<0.001). This implies that positive attitude is as a result of good knowledge. The local food vendors who possessed good knowledge of food hygiene were 23.3 times more likely to express positive attitude towards food hygiene.

4. Discussion

4.1. Knowledge of Food Hygiene

The knowledge of food hygiene among local food vendors in Obio Akpor LGA as reported in this study was categorized as good, fair, and poor at 90.8%, 8.3% and 0.9% respectively. This implies that majority of the local food vendors had good knowledge on food hygiene. This is attributed to the fact that majority of the respondents have received some form of education, also majority were females who have been groomed in their homes on food hygiene and its importance. Having good knowledge is a bedrock of every good practice. The proportion of local food vendors (LFVs) who possess good knowledge of food hygiene in this study were high, which is similar to the study in Imo State where food hygiene knowledge was 81.0%. This is as a result of the level of education [8]. Similarly, in Bauchi State 91.0% of the respondents have good knowledge of food hygiene and safety, which may be as a result of food hygiene training received [19]. On the other hand, the proportion rate in Jos, Plateau is 60.9% [20] and 67.3% in North Dayi District of Ghana [21], which is lower than that of this study. 93.7% of food vendors had good food hygiene knowledge in Tanuggyi Township, Myanmar [22]. Also, a study in Ejisu-Juaben municipality of Ghana, 98.8% of the respondents had good food hygiene knowledge. This could be because majority of the food vendors had attained the basic level of education [23].

Furthermore, only 49% of respondents in Maseru Lesotho which was considered poor due to no food hygiene training reported by high percentage of the respondents [24]. Also, in Sohag Egypt, 39.2% possessed good food hygiene knowledge (FHK), which is poor [25]. In Padawan, Sarawak in Malaysia, only 22.0% had good knowledge. This might be linked to the fact that two third of street food vendors in Padawan had not received any formal training on food hygiene/ safety [26].

In this study, only 13.3% of the respondents have had training on food hygiene/safety practice, which implies majority of the LFVs are not trained which could affect practice. Though the proportion was low, it is lower than that reported in a study by Yusuf and Chege [1] in Nasarawa, Nigeria, who reported a proportion of 29.7% among street food vendors. Similarly, 11.5%, 18.0%, 28.7% and, 32.0% were reported in Jos-Plateau, Bauchi, Benin and Owerri respectively as proportion of vendors who have been trained [27], [19], [20], [8]. Extrapolating from these results one could say that there in need for massive training of food vendors across all States in Nigeria. Lamina-Bomina [28], reported that only 10.3% of the respondents in Bo City Southern Sierra Leone had received formal training, which similar to 10.8% obtained in Northwest Ethiopia [29]. Also, 39.7% was reported in Maseru, Lesotho as the proportion of street food vendors who have had training on food hygiene/safety. In Ejisu-Juaben municipality and North Dayi district both in Ghana, 83.2% and 67.3% respectively, were reported as the proportion of trained food vendors [23], [21].

4.2. Food Hygiene Attitude

In this study, 94.1% of the respondents had positive food hygiene attitude (FHA) and only 5.9% having a negative attitude. The high proportion of food vendors who had positive attitude could be attributed to having good knowledge about food hygiene and having attained basic level of education. This is similar to the result in Bauchi metropolis were 93% respondents had good attitude towards food hygiene [19]. In Owerri, 71% of the respondents had positive attitude which is lower than that obtained in this study [8]. A study in the tertiary institutions in Lagos Mainland reported 64% as the proportion for positive attitude [30]. Having good knowledge could be the reason for the proportions obtained for attitude in the above studies. Cuprasitruit et al., [31] in a study in Bangkok reported that 94% respondents had positive attitude which is also similar to a study in Kolkata India, with 89.6% proportion rate for positive attitude among the food vendors [32]. These studies have similar proportions to that obtained in this study.

The studies conducted in Northern Kuching city and Padawan Sarawak both in Malaysia reported a proportion rate of 19.1% and 15.4% as good FHA, which is very low compared to that obtained in this study [33], [26]. This could be as a result of lack of training leading to poor knowledge. Also, a low proportion rate of 33% was obtained in a study in Jashore region Bangladesh as good FHA [34].

The proportion of food vendors who agree that safe food handling is an important aspect of their responsibility in this study was 99.3% which is similar to 86.5% obtained in Owerri; 82.1% in Padawan Sarawak and 73.4% in Kolkata, India [8], [26], [32]. In Jashore region, Bangladesh only 35.5% agrees that safe food handling is part of their duty which is lower than the proportion rate in this study [34]. Letuka et al., [24] in Maseru Lesotho, reported that 84% of the respondents agree that thoroughly cooked foods are free from contamination which is similar to 81% gotten in this study but 62.3% was reported in Kolkata India, which is a little lower [32].

4.3. Level of Hygiene Practices

Hygiene practices during food handling are key determinant to the safety of food consumed to maintain an optimum health. This study showed a proportion of food vendors who practiced good food hygiene to be 34.6% which is below the proportion rate for food hygiene knowledge and attitude. The implication of this result points to preparation and consumption of unhygienic foods by customers which predisposes them to food borne diseases which have negative effects on health and economy. This could be due to lack of training, supervision, poor water supply and infrastructure, and I recommend provision of waters sources in public places and infrastructure. Also, environmental health workers should ensure that LFVs are periodically trained, and supportive supervision is carried out on regular bases to ensure proper hygiene practices. This finding compares favourably to studies carried out in Owerri were 36.5% was reported as good food hygiene practices (FHP) [8]. The study in Jos, Plateau by Afolaranmi et al., [20], reported a higher proportion of 56.3% while, Yahaya et al., [19] in Bauchi metropolis reported a higher proportion of 90.3% for good FHP. The high proportion rate of good FHP among food vendors in Bauchi metropolis was due to training programs organized. A study in Gamo Gofa zone, Southern Ethiopia reported a similar result of 32.6% as proportion rate for good FHP [35]. Another study in Dangila and University of Gondar both in Northwest Ethiopia revealed that more than half (which is 52.5% and 53.3% respectively) of the respondents practiced good hygiene which is greater than that obtained in this study [29]; [36]. This could be as a result to poor supervision by environmental health officers and lack of training exercise. A higher proportion rate of 62.9% was reported in North Dayi District, Ghana, this could be attributed to knowledge of hygiene [21]. Htway and Kallawicha [22] revealed a slightly higher proportion rate of 41% in Taunggyi Township, Myanmar. In Kolkata India, less than one third of the respondents had good FHP which is similar to this study, while in Padawan Sarawak and Jashore region of Bangladesh a lower proportion rate of 7.7% and 0.5% was reported for good FHP [32], [26], [34]. However, a contrasting study in one governmental organization in Tehran, reported 100% for good FHP, although supervisors during a visit to these vendors observed poor hygiene practice. This is because the food vendors were educated and probably chose the best option for each question in the questionnaire administered. The respondents revealed that the practice of good hygiene is stressful, also time and resource consuming [37].

In this study, 95.3% of respondents in this study always wash their hands before cooking, which is greater than 56.8%, 71.8% and 86% reported in Nasarawa, Padawan and Jashore region Bangladesh respectively [1], [26], [34]. Findings in this study revealed that 87% sometimes wear head cover but studies in Owerri, Gamo Gofa zone Southern Ethiopia, Bangladesh, Kolkata India and Padawan reported 59%, 28.5%, 2.5%, 11.3% and 29.9% respectively as the proportion of respondents who always wear hair cover/cap [8], [35], [34], [32], [26]. This study also obtained 82.2% as proportion of those who sometimes wear apron while 42.4%, 59%, 64% and 78.6% were obtained in Nasarawa, Owerri, Maseru Lesotho and Dangila Northwest Ethiopia respectively [1], [8], [24], [29]. Although, the proportion of those who wore an apron were high, it is pertinent to note that most of their aprons were dirty. However, only 10% carried out periodic medical examination in this study as against 59.4% in Owerri [8].

4.4. Factors associated with Knowledge of Food Hygiene

Findings in this study reveals that there is a statistically significant association between sex and knowledge of food hygiene (χ^2 =9.804, p=0.002). Female LFVs were 0.3 times more knowledgeable about food hygiene compared to male LFVs (OR = 0.3; 95%Cl: 0.2-0.7). This is because food vending business is predominantly operated by mostly females. A statistically significant association was established between education level and knowledge of food hygiene (χ^2=7.151 p=0.007). Local food vendor who had tertiary education were 5.8 times more knowledgeable compared to those who had secondary/primary/vocational/no education (OR = 5.8; 95%Cl: 1.4-24.4). Tertiary educated LFVs were more knowledgeable because they can easily access and understand information on importance of food hygiene. Graduates who operated this kind of business were due to lack of employment and profit margin of food vendors. Also, there is a significant relationship between years of experience and knowledge of food hygiene (χ^2=3.933, p=0.047). Local food vendors with >10 years of experience were 2.8 times more knowledgeable compared to those who had ≤10 years of experience (OR = 2.8; 95%Cl: 0.9-8.1). This may be explained in the sense that LFVs with >10 years of experience had large customer base and were acquiring new knowledge to ensure they do not lose any customer due to food borne illness. Age group, marital status, having license and training on food hygiene showed no statistical significance.

A contrasting study in Ejisu-Juaben municipality, Ghana revealed no significant association between knowledge and education, sex and years of experience but showed a statistically significant association with religion, marital status, having license and training on food hygiene [23]. A study in North Dayi District, Ghana revealed a significant association between FHK and registered food vendors only [21]. In Maseru Lesotho, no significant association was found to exist with knowledge and gender, age and educational level but, training on food hygiene showed a statistical significance (p=0.004) [24]. This implies that FVs training on food hygiene/safety impacted positively on knowledge.

Furthermore, a similar study in Taunggyi township, Myanmar revealed a significant association of knowledge with sex, education, and ethnic group ($p<0.001$). No significant association was established between knowledge and training [22]. In Handan China, only age and sex among the social demographic data showed a statistically significant difference ($p=0.001$ and $p=0.01$ respectively). Male street food vendors (SFVs) were more knowledgeable compared to females; also, SFVs below 35 years of age were more knowledgeable when compared to others [14]. Hossen et al., [34] in his study found educational level to have a significant association with knowledge ($p=0.01$). Gender, age, and years of experience were found to have no significant association. Although, 81.5% SFVs with 10-20 years' experience had good FHK compared to 76.5% of those with >20-years' experience.

4.5. Factors associated with Food Hygiene Attitude

This study shows that there is a statistically significant association between sex and food hygiene attitude ($\chi^2 =38.736$, $p<0.001$). This implies that the female food vendors are more likely to express positive attitudes towards food hygiene/safety (OR = 0.1; 95%Cl: 0.0-0.2). This could be explained in the sense that females are groomed in a typical Nigerian family on food hygiene. There is a statistically significant relationship between age group and FHA ($\chi^2=5.248$, $p=0.022$). Local food vendors who are >35 years were 2.6 times more likely to express positive attitudes compared to those ≤ 35 years, (OR = 2.6; 95%Cl: 0.9-1.0). This implies that increase in age improves FHA. Also, education level ($\chi^2=7.512$, $p=0.006$) and years of experience ($\chi^2=7.931$, $p=0.005$) were significantly associated with FHA. This signifies that LFVs with tertiary education and >10 years of experience were 0.9 times more likely to express positive food hygiene attitude when compared to others with lesser education qualification (OR=0.9; 95%Cl: 0.8-0.9) and ≤10 years of experience (OR=0.9; 95%Cl: 0.9-1.0). Additionally, an association between knowledge and attitude of food hygiene was statistically significant ($\chi^2=81.628$, $p<0.001$). The local food vendors who possessed good knowledge FHK were 23.3 times more likely to express positive food hygiene attitude.

The study in Sohag Egypt, only showed a statistically significant association between attitude and level of education ($p=0.033$) but, no significant association with age, sex and years of experience. Only 39.2% food handlers were knowledgeable about food hygiene against 61.2% who had positive FHA. This implies that positive attitude displayed could be as a result of routine practice not based on knowledge [25]. Pearson's correlation revealed a positive correlation of attitude with knowledge in a study conducted at North Dayi District, Ghana. Also, no significant association was established between FHA and the following socio-demographic data; gender, age group, marital status, educational level, years of experience and training on food hygiene/safety [21].

This study however contrasts study conducted in Bangladesh, where no statistically significant association were found with age, sex, educational status and years of experience [34]. A cross-sectional study in Tehran, found that attitude is significantly associated with knowledge and sex which is similar to this study. Also, findings in this study assert that passing the training course on food hygiene results in positive attitude [37]. A study in Northern Kuching city, Sarawak, showed that attitude is significantly associated with training on food hygiene ($p<0.01$) which is in contrast with this study. Trained FVs were 3.66 times more likely to have positive attitude. Also, a significant association was seen between attitude and knowledge ($p<0.05$). Knowledgeable food vendors were 1.17 times more likely to have positive attitude [33]. Another similar finding from Kolkata in India revealed that attitude was statistically significant with age, gender, and education. Male SFVs were 5.67 times more likely to have positive attitude when compared to females [32].

5. Conclusion

The increase reliance on out-of-home feeding in Nigeria due to globalization has made local food vendors a key contributor to the state of health of the populace, thereby impacting public health. This research, conducted in Obio-Akpor Local Government Area of Rivers State, aimed to assess the food hygiene knowledge, attitude and practices of these LFVs.

The findings reveal that majority of the LFVs possess good food hygiene knowledge (90.8%) and a positive food hygiene attitude (94.1%). This high level of food hygiene knowledge and attitude can be attributed to the fact that most respondents had received some form of education and were females who had been taught from home the importance of food hygiene. Knowledge of food hygiene was found to be significantly associated with sex ($p=0.002$), education ($p=0.007$), and years of experience (0.047). Similarly, attitudes towards food hygiene were associated with sex ($p<0.001$), age group ($p=0.022$), level of education ($p=0.006$), years of experience ($p=0.005$), and food hygiene knowledge ($p<0.001$). Therefore, having good food hygiene knowledge, often leads to positive food hygiene attitude.

In spite of the high levels of knowledge and positive attitudes, only one-third of the LFVs showed good food hygiene practices. These findings reveal the gap existing between knowledge and practice of food hygiene which makes it a public health importance, since poor food hygiene practices predisposes the populace to food borne diseases.

It is my recommendation that workshops should be organized yearly for food vendors and evaluation of food hygiene knowledge and skills tested before yearly renewal of their license to operate by concerned bodies in the State government. Additionally, regular monitoring or inspection of LFVs by State Environmental Health Officers (EHO) cannot be overemphasis and is encouraged.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that there is no conflict of interest.

Statement of ethical approval

Ethical approval and clearance for this study was sort and obtained from the Ethical and Research Committee of the University of Port Harcourt before commencing the study with the protocol number UPH/CEREMAD/REC/MM84/034. Permission was also obtained from environmental health office in Obio/Akpor LGA.

Statement of informed consent

All participating food vendors gave informed consent and they were assured of confidentiality and anonymity during this study.

References

[1] Yusuf TA, Chege PM. Awareness of Food Hygiene Practices and Practices among Street Food Vendors in Nasarawa State, Nigeria. International Journal of Health Sciences and Research. 2019;9(7):227-33.

[2] US Department of Agriculture. Food Expenditures. 2018. https://www.ersusda.gov/data-products/food-expenditures.aspx.

[3] Akintaro OA. Food handling, hygiene, and the role of food regulatory agencies in promoting good health and development in Nigeria. International Journal of Health and Medical Information. 2012;1(1–3):1–8.

[4] Cohen MJ, Garnet JL. The food price crisis and urban food (in) security. Human Settlement Working Paper Series; Urbanization & Emerging Population. 2002.

[5] Asiegbu CV, Lebelo SL, Tabit FT. The food safety knowledge and microbial hazards awareness of consumers of ready-to-eat street-vended food. Food Control. 2016; 60:422-9.

[6] Aluh FO, Aluh DO. Knowledge, attitudes, and practices of food hygiene among mobile food vendors in a Nigerian rural settlement. International Journal of Community Medicine and Public Health. 2017;4(11):4025-30.

[7] World Health Organization. World Health Day 2015: From farm to plate make food safe [Internet]. 2015 Apr 2. Available from: https://www.who.int/news/item/02-04-2015-from-farm-to-plate-make-food-safe

[8] Iwu AC, Uwakwe KA, Duru CB, Diwe KC, Chineke HN, Merenu IA, et al. Knowledge, Attitude and Practices of Food Hygiene among Food Vendors in Owerri, Imo State, Nigeria. Occupational Diseases and Environmental Medicine. 2017; 5:11-25. Available from: https://doi.org/10.4236/odem.2017.51002

[9] Danikuu FM, Baguo FB, Azipala O. Hygiene practices among street food vendors in Tamale Metropolis. Journal of Medical and Biomedical Sciences. 2015;4(3):25-30.

[10] World Health Organization. WHO estimates of the global burden of food borne diseases: food borne disease burden epidemiology reference group 2007-2015 [Internet]. 2015 Dec 1. Available from: https://www.who.int/publications/i/item/9789241565165

[11] Omojokun J. Regulation and Enforcement of Legislation on Food Safety in Nigeria. 2013. Available from: http://www.intechopen.com/books/mycotoxin-and-food-safety-in-developing-countries/regulation-and-enforcement-of-legislation-on-food-safety-in-nigeria

[12] World Bank. The Safe Food Imperative: Accelerating Progress in Low- and Middle- Income Countries. 2018.

[13] Zhao Y, Yu X, Xiao Y, Cai Z, Luo X, Zhang F. Netizens' food safety knowledge, attitude, behaviours, and demand for science popularization by WeMedia. International Journal of Environmental Research and Public Health. 2020;17(3):730–40. Available from: https://doi.org/10.3390/ijerph17030730.

[14] Ma L, Chen H, Yan H, Wu L, Zhang W. Food safety knowledge, attitudes, and behaviour of street food vendors and consumers in Handan, a third-tier city in China. BioMed Central Public Health. 2019;19(1):1128–39. Available from: https://doi.org/10.118i6/s12889-019-7475-9.

[15] Yenealem DG, Yallew WW, Abdulmajid S. Food safety practice and associated factors among meat handlers in Gondar town: a cross-sectional study. Journal of Environmental Public Health. 2020; 1:1–7.

[16] Food and Agricultural Organization. World Hunger Report: High Volatile Price set to Continue. 2011. Available from: http://www.fao/news/story/en/item/92495/icode/

[17] Odo SE, Uchechukwu CF, Ezemadu UR. Food borne 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.

[18] Cochran WG. Sampling Technique. 3rd ed. New York: John Wiley and Sons Inc.; 1977.

[19] Yahaya F, Suriani I, Saliluddin SM, Jibrin AG. Factors associated with food hygiene practices among street food vendors in selected food vending locations of Bauchi Metropolis, Nigeria. International Journal of Public Health and Clinical Sciences. 2018;5(2):196-208.

[20] Afolaranmi TO, Hassan ZI, Bello DA, Misari Z. Knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau. Journal of Medical Research. 2015;4(2):16-22.

[21] Tuglo LS, Agordoh PD, Tekpor D, Pan Z, Agbanyo G, Chu M. Food safety knowledge, attitude, and hygiene practices of street-cooked food handlers in North Dayi District, Ghana. Environmental Health and Preventive Medicine. 2021;26(1):1-13.

[22] Htway TAS, Kallawicha K. Factors associated with food safety knowledge and practice among street food vendors in Taunggyi Township, Myanmar: A cross-sectional study. Malaysian Journal of Public Health Medicine. 2020;20(3):180-8.

[23] Addo-Tham R, Appiah-Brempong E, Vampere H, Acquah-Gyan E, Gyimah Akwasi A. Knowledge on food safety and food-handling practices of street food vendors in Ejisu-Juaben Municipality of Ghana. Advances in Public Health. 2020.

[24] Letuka P, Nkhebenyane S, Thekisoe O. Assessment of food safety knowledge, attitudes and practices among street food vendors and consumers' perceptions of street food vending in Maseru Lesotho. Europe PudMed Central. 2019.

[25] Hamed A, Mohammed N. Food safety knowledge, attitudes and self-reported practices among food handlers in Sohag governorate, Egypt. Eastern Mediterranean Health Journal. 2020;26(4):374-81.

[26] Jores D, Arif MT, Rahman MM. Factors associated with food hygiene practices among street food vendors in Padawan, Sarawak. Borneo Journal of Resource Science and Technology. 2018;8(1):56-65.

[27] Okojie PW, Isah EC. Food hygiene knowledge and practices of street food vendors in Benin City, Nigeria. International Journal of Consumer Studies. 2019;43(6):528-35.

[28] Lamin- Boima PT. Knowledge attitude and practice of street vendors in selected schools within Bo City Southern Sierra Leone. International Journal of Scientific & Technology Research. 2017;6(12):254-72.

[29] Tessema AG, Gelaye KA, Chercos DH. Factors affecting food handling Practices among food handlers of Dangila town food and drink establishments, North West Ethiopia. BMC Public Health. 2014;14(1):1-5.

[30] Ifebajo AY, Eboh JO. Assessment of Food Hygiene Practices among Vendors In Tertiary Institutions in Lagos Mainland. Assessment. 2021;1(11).

[31] Cuprasitrut T, Srisorrachatr S, Malai D. Food safety knowledge, attitude and practice of food handlers and microbiological and chemical food quality assessment of food for making merit for monks in Ratchathewi District, Bangkok. Asia Journal of Public Health. 2011;2(1):27-34.

[32] Mukherjee S, Mondal TK, De A, Misra R, Pal A. Knowledge, attitude and practice of food hygiene among street food vendors near a tertiary care hospital in Kolkata, India. International Journal of Community Medicine and Public Health. 2018;5(3):1206-11.

[33] Rahman MM, Arif MT, Bakar K, Tambi Z. Food safety knowledge, attitude and hygiene practices among the street food vendors in Northern Kuching City, Sarawak. Borneo Science. 2012; 31:95-103.

[34] Hossen M, Ferdaus M, Hasan M, Lina NN, Das AK, Barman SK, et al. Food safety knowledge, attitudes and practices of street food vendors in Jashore region, Bangladesh. Food Science and Technology. 2020; 41:226-39.

[35] Legesse D, Tilahun M, Agedew E, Haftu D. Food handling practices and associated factors among food handlers in arba minch town public food establishments in Gamo Gofa Zone, Southern Ethiopia. Epidemiology (Sunnyvale). 2017;7(302):2161-1165.

[36] Lema K, Abuhay N, Kindie W, Dagne H, Guadu T. Food hygiene practice and its determinants among food handlers at University of Gondar, Northwest Ethiopia, 2019. International Journal of General Medicine. 2020; 13:1129.

[37] Fariba R, Gholamreza JK, Saharnaz N, Ehsan H, Masoud Y. Knowledge, attitude, and practice among food handlers of semi-industrial catering: a cross-sectional study at one of the governmental organizations in Tehran. Journal of Environmental Health Science and Engineering. 2018;16(2):249-56.