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Knowledge and Practice of Food Hygiene Among Food Vendors in Ihiagwa, Owerri West Local Government Area, Imo State

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Abstract

Food hygiene includes all conditions and measures necessary to ensure the safety, suitability and wholesomeness of food at all stages of the food chain. The objective of this study was to ascertain the knowledge and practice of food hygiene among food vendors in Ihiagwa, Owerri-West L.G.A. A descriptive cross-sectional design was used in this study as a quantitative research approach. 221 food vendors were selected using the stratified sampling technique. Data was collected with the use of a questionnaire and also with observations of general hygiene and cleanliness. Data was captured in Excel sheet and imported into SPSS version 20.0 for analysis. The results of this study showed that most of the food vendors 99(44.5%) were between 30-39 years of age. Females recorded 166(75%) while males had 55(25%); 183(82.8%) reported that they have not attended any food hygiene training; only 28(12.7%) of the food vendors reported that they always cover their hair while serving food; 188(85.1%) reported that their food premises have not been visited by environmental health officers, only 51(23.1%) of the food vendors said that they go for routine medical examinations and 5(2.3%) said that well water was their main source of water supply. The age of the respondents showed a significant relationship with their knowledge of food hygiene (X^2=15.53 at P=0.008). The Age, gender and educational status of the respondents all showed a significant relationship with their practice of food hygiene.

Keywords: *hygiene, knowledge, practice, food, vendors, ihiagwa,*

Introduction

The spread of diseases through food is still a common problem which results in appreciable morbidity and occasional mortality. The number of reported foodborne illnesses has increased recently throughout the world. These reports have shown that inadequate food hygiene and safety practices during food handling, preparation and serving are the major causes. The street food industry plays an important role in developing countries in meeting the food demands of the urban dwellers. Street foods feed millions of people daily with a wide variety of foods that are relatively cheap and easily accessible. Street food may be consumed where it was purchased or can be taken away and eaten elsewhere (WHO, 1996).

The street food industry offers a significant amount of employment, often to persons with little education and training. The established food safety know how among surveyed street food vendors regarding food contamination, types and symptoms of food-borne diseases was significant since pathogenic microorganisms had also been isolated from many street foods vended foods (Omemu *et al.*, 2005).

The World Health Organization (2000), estimated that over twenty (20) million people (mostly children) die globally from diarrhea diseases each year as a result of eating contaminated food (Amadi, 2009). According to WHO (1989), food handling personnel play important role in ensuring food safety throughout the chain of food production and storage. Mishandling and disregard of hygienic measures on the part of the food vendors may enable pathogenic bacteria to come in contact with food and in some cases survive and multiply in sufficient numbers to cause illness in the consumer. Tivadar (2003), highlighted the increasing prevalence of eating away from home and the use of partly or fully cooked food. Most of the vendors who sold both raw and cooked food items

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were not regulated, they operated haphazardly without any monitoring of what they prepared and how they prepared it (Abdalla *et al*., 2008).

A growing body of data from food-borne diseases of various etiologies suggest that eating food prepared by food vendors is an important source of infection (Clinical Infectious Disease control, 2006). Reports of food-borne disease outbreaks in various countries have resulted from unhygienic food establishments (Zero and Kumie, 2007). According to reports, there were about 737 outbreaks of food-borne diseases with a total of 52,011 cases reported to the Centre for Diseases Control and Prevention (CDC). Thirty three percent (33%) of these outbreaks were related to consumption of food from food vendors.

Urban and semi-urban centers, major highways and streets are indiscriminately lined with these food vendors (Oreyomi,2006). These food vendors are patronized by large number of people particularly in the urban centers due to their easy availability and accessibility. According to FAO, 2.5 billion people worldwide eat from food vendors every day. The general practices in most of these places are poor food handling, filthy environment and most times, poor quality food items are used in the food preparation, for example, spoilt fresh tomatoes. Plates and cutlery are hurriedly washed so as to attend to many customers, hence carrying contaminants such as soap and dirt in the water. The environment in which food is stored and served are often infested with flies, cockroaches and rodents, towels for cleaning hands are usually shared by customers, thus exposing them to cross-infections.

Nutritional status, health, physical and mental wellbeing depend on the food eaten and how it is being eaten. Access to good quality food has been man's main endeavor from the earliest days of human existence. Safety of food is a basic requirement of food quality. "Food Safety" implies absence or acceptable and safe levels of contaminants, adulterants, naturally occurring toxins or any other substance that may make food injurious to health on an acute or chronic basis. Food quality can be considered as a complex characteristic of food that determines its value or acceptability to customers. Besides safety, quality attributes include nutritional value, organoleptic properties such as appearance, colour, texture, taste and functional properties. Food systems in developing countries are not always as well organized and developed as in the industrialized world. Moreover, problems of growing population, urbanization, lack of resources to deal with pre and post-harvest losses in food and problems of environmental and food hygiene mean that food systems in developing world continue to be stressed, adversely affecting the quality and safety of food supplies. People in developing countries are therefore exposed to a wide range of potential food quality and safety risks.

A study conducted by Muinde and Kuria (2005), on hygienic and sanitary practices of vendors of street foods in Nairobi, Kenya to determine hygienic and sanitary practices of vendors of street foods discovered that about 62% of the food vendors obtained food preparation skills through observation while 33% were taught by their parents in non-formal settings. The preparation surfaces used for the preparation of raw foods were not washed regularly. Cooked foods were stored at ambient temperature in cupboards. 85% of the vendors had garbage and waste bins beside the food stalls. Personal hygiene was not also observed, as the vendors never covered their heads, handled money and food at the same time and they did not wear aprons and handled food with bare hands.

Temesgen (2016), conducted a similar study on hygienic and sanitary practices of street food vendors in the city of Addis Ababa, Ethiopia. A total of 140 street food vendors in two sub-cities were investigated from September 2014 to March 2015. A structured questionnaire, interviews and extensive observation was used for data collection. Most of the street vendors (78.9%) were women. The majority of the vendors (68.5%) had either primary or no education. Among the vendors 88.6% did not have aprons and 95% did not cover their hair during cooking process. 35% of the food vendors change the water for washing utensils only when it is dirty. 90.7% of the food vendors used recycled paper to serve the customers. All the vendors (100%) handled money with bare hands while serving food. 78.6% of the vendors prepared their food along the road side.

In a similar study conducted by Omemu and Aderoju (2008), on food safety knowledge and practices of street food vendors in Abeokuta, Nigeria, data was collected from 87 food vendors using a 67-questions standardized survey tool. Few vendors (12%) acquired the knowledge of food preparation by formal training. Only 31% of the respondents had the annual medical health certificate. Volume and price are considered more than freshness and cleanliness when purchasing raw materials. Some of the food safety knowledge of the food vendors could not be translated to practice due to the absence of basic facilities.

The level of food hygiene and safety practices in Nigeria is generally known as not being of high standard and this to a large extent plays a significant role in the etiology of food-borne diseases in the country. Reports of food-borne diseases outbreaks in various countries have resulted from unhygienic food handling and preparation practices within food establishments. Food-borne diseases are a growing public health problem worldwide (WHO, 2009). It therefore becomes pertinent that a solution should be proffered against the prevalence of food-borne diseases. This study scrutinizes the level of food hygiene practices among street food vendors as they offer a wide variety of ready to eat foods sold and sometimes prepared in public places. Due to the unregulated activities of the street food vendors, recorded poor personal and community hygiene and poor hygiene practices in food handling, the need exists for food vendors to be trained on basic principles of safe food handling.

Materials and method

This study was carried out in Ihiagwa Community situated in Owerri-West LGA, Imo State, Nigeria. The community is composed of eight (8) villages, namely: Umuelem, Umuchima, Mboke, Nnkramochie, Iriamogu, Aku/Umuokwo, Ibuzo and Umuezeawula. The study design used for this study was a cross-sectional descriptive study design.

The population of this study comprises of all food vendors in Ihiagwa community excluding hawkers. There are 165 local restaurants (bukas) and 331 makeshift food stalls spread across the 8 villages in Ihiagwa community at the time of this study which make up a total of 496 food vendors. The Taro Yamane (1967), formula for finite population was used for the calculation of the sample size of this study which gave a sample size of 221 which constitute 44.5% of the population.

Stratified sampling technique was used for the study. The 8 villages that make up Ihiagwa community were used for the study. The food vendors were first stratified based on the type of structure in which they operated which were food vendors that operated in local restaurants (bukas) and those that operated in makeshift stalls.165 of the food vendors operated in local restaurants while 331 of them operated in makeshift stalls. A proportional sample using the percentage contribution of each stratum of the food vendors in each village to the total population was used Systematic random sampling was then used for the selection of each type of food vendor from the 8 villages. The food vendors were listed and numbered to form the sample frame. The sample interval was 2. Numbers 1 and 2 were written on a paper and chosen by simple random sampling (balloting) number 2 was selected and became the first. Thereafter, every second one on the list was selected until 221 food vendors were selected.

The instruments for data collection in this study were a structured questionnaire and an observation checklist adopted from the "WHO essential requirement for safety of street-vended foods". The questionnaire was designed into three sections (A-C) The sections of the questionnaire include; Section A- Socio-Demographic characteristics of the food vendors, Section B- Knowledge of food hygiene among the food vendors, Section C- Practice of food hygiene and safety among the food vendors. The questionnaire was administered to the respondents after an oral consent was obtained. The literate respondents were allowed to fill the questionnaire themselves but for non-literate respondents, the questions were asked and their responses filled by the researcher. The observation checklist was used for personal observation of the food hygiene and sanitation practices of the selected food vendors.

The instrument used in the study was vetted in relevance to the topic, coverage of content areas, appropriateness of language usage and clarity of the items. Their constructive contributions were used to modify the final draft. The reliability of the instrument was established through pretesting of the instrument. The questionnaire was administered to twenty food vendors in Nekede community who were not part of the study population but shared similar characteristics with Ihiagwa as a neighboring community.

Data for the study were cross tabulated in an excel worksheet and imported into statistical package for social sciences (SPSS, Version 20.0). The analysis was done using descriptive statistics based on the study objectives and results were presented in tables and charts. Graphical illustrations was done using pie chart and bar chart to aid visual appreciation of remarkable observations. Multivariate regression analysis and Chi-square test was used to test the relationship between the socio-demographic characteristics of the respondents and their food hygiene knowledge and practice. The significance level for all statistical analysis was set at $p \leq 0.05$.

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Results

Table 1: Socio-demographic Characteristics of the Respondents

Table 1 showed the socio-demographic characteristics of the respondents; where majority 166(75%) were females while 55(25%) were males. Majority 99(44.8%) of the assessed respondents were between 30-39 years while the least percentage (2.7%) were <20 years. From the same table, 132(59.7%) had secondary education; 28(12.7%) attained tertiary education and only 61(27.6%) ended in primary education.

Table 2: **Knowledge of Respondents on Food Hygiene**

Table 2 presented the knowledge of respondents on food hygiene; the following were reported by respondents on keys to safer food include all except; separate raw from cooked food 17(7.7%), cook food thoroughly 39 (17.6%), use safe water 11(5%) and 154(69.7%) said cook with salt. It is important to prepare food safely because; majority 204(92.3%) reported that safely prepared food prevents food poisoning; 160(72.4%) said food hygiene practice is aimed at reducing foodborne illness; large number 133(60.2%) reported that handkerchief is not one of the protective wears that reduces the risk of food contamination. As regards the reason for keeping raw and cooked food separate; majority 166(75.1%) said to prevent food contamination and 89(40.3%) reported the bottom part of the refrigerator as best to store raw meat.

Table 3: Age of Respondents in Relation to Knowledge of Food Hygiene

Table 3 depicts the age of respondents in relation to knowledge of food hygiene; majority 90(90%) of those that had good knowledge of food hygiene were aged between 30-39 years. The age of respondents showed a significant relationship with knowledge of food hygiene (X^2=15.53 at p=0. 008).

Table 4: Multivariate Regression Analysis

Table 4 depicts the multivariate regression analysis to further illustrate the strength of the significant relationship between age and knowledge; majority 99(45%) were aged between 30-39 years. The age group between 30-39 years showed a high significant difference in relation to knowledge of food hygiene (R^2=0.622 at p<0. 001).

Table 5: Gender of Respondents in Relation to Knowledge of Food Hygiene

Table 5 depicts the gender of respondents in relation to knowledge of food hygiene; majority 106(68%) that had good knowledge of food hygiene were females compared to their male counterparts that had 37(67%). Therefore, gender has no significant relationship with knowledge of food hygiene (X^2=0.21 at p-value of 0.646).

Table 6: Educational Level of Respondents in Relation to Knowledge of Food Hygiene

Table 6 presents the educational status of the respondents in relation to their knowledge of food hygiene; greater number of them 132(59.7%), attended secondary education and few of them 50(38%) had poor knowledge of food hygiene. Thus, educational status has no significant relationship with knowledge of food hygiene (X^2=3.43 at p-value of 0.331).

Table 7: Attendance of Routine Medical Examination by Respondents and Visitation of Environmental Health Workers

Table 7 depicted the attendance of Routine Medical Examination by Respondents and Visitation of Environmental Health Workers where 51(23.1%) agreed that they go for routine medical examination and only 33(14.9%) reported that environmental health workers do visit their food premises.

Table 8: Personal Food Hygiene Practices of Respondents

In Table 8, majority 133(60.2%) and 138(62.4%) reported they always wash their hands and food items before cooking respectively; large number 84(38%) and 98(44%) said they seldom wear apron and head gear while serving food respectively; 115(52%) said they always clean cooking surfaces, 91(41%) said they do it often and 15(7%) reported that they seldom clean their cooking surfaces.

Table 9: Food Hygiene Practices of Respondents

In table 9, 144(65.2%) said they refrigerate their leftover food and 77(34.8%) said they reheat and cover it. On the source of water supply; 139(62.9%) said they get water from borehole, 5(2.3%) said from well water while 77(34.8%) said from commercial water tanker. Majority 111(50.2%) of the food vendors said they practice open dumping of refuse and greater percentage (55.2%) said water cistern was their means of disposing liquid waste.

Table 10: Age of Respondents in Relation to Practice of Food Hygiene

Table 10 showed the significant relationship between age and practice of food hygiene among the food vendors in Ihiagwa, Owerri-West L.G.A. (X^2= 308.4; Df = 5; P-value = 0.001).

Table 11: Gender of Respondents in Relation to Practice of Food Hygiene

Table 11 showed the significant relationship between gender and practice of food hygiene among the food vendors in Ihiagwa, Owerri-West L.G.A (X^2= 48.45; Df = 1; P-value = 0.001).

Table 12: Educational Level of Respondents in Relation to Practice of Food Hygiene

Table 12 showed a significant relationship between educational level and practice of food hygiene among food vendors in Ihiagwa, Owerri-West (X^2= 161.64; Df = 3; P-value = 0.000).

Table 13: Researcher's Observation of the Food Vending Premises

Table 13 depicted the researcher's observation of the food vending premises. Cleanliness of environment of food vending 139(62.9%) was fair; washing of cooking utensils 156(70%) was poor; presence of waste bin was fair 111(50.2%) ; 130(58.8%) scored poor in covering of food items; wearing hand jewelry while serving food majority 129(58.4%) was fair; rate of keeping long nails by the food vendor was fair 146(66.1%); food vendors covering their hair while serving food was poor 171(77.4%) and 170(76.9%) wore no apron while serving food. Presence of flies was fair 127(57.5%) and reheating food before sale 122(55.2%) scored fair; only 63(28.5%) had good supply of portable drinking water.

Figure 1: **Meaning of Food Hygiene**

Figure 1 presented the knowledge of respondents on the meaning of food hygiene; 45% of them said they understand food hygiene as preserving and preparing food to ensure its safety, 39% said that it is the act of protecting food from contaminants; 8% were of the opinion that washing one's hand before handling food is food hygiene; 5% said that maintaining a clean environment while preparing food is food hygiene while the least percentage (3%) said it is a process of separating raw and cooked food.

Figure 2: Using the Same Cutting Board/Tray between Raw and Cooked Foods

The figure 2 indicated that majority 188(85.1%) of respondents were of the opinion that the same cutting board/tray should not be used between raw and cooked food without washing because it can cause cross-contamination and the least 6(2.7%) said it should not be used because it makes the food salty.

Figure 3: Reason for Reheating Cooked Food

Figure 3 indicated that majority 187(84.6%) of respondents reported that the reason for reheating cooked food was to avoid food poisoning.

Figure 4: Respondents that have Attended Food Hygiene Seminar /Workshop/Training

The pie chart presents the food hygiene training/workshop attendance of the respondents. 38(17.2%) said they have attended food hygiene training/workshop while 183(82.8%) reported that they have had no training at all. (Figure 4)

Figure 5: Period of Environmental Health Officers Visit to Food Premises

The pie chart below presented the period of environmental health officers visit to food premises; greater percentage (82%) reported every year and least (1%) said every month.

Discussion

In this study, majority of the food vendors were females which is not surprising because the environment is dominated by low educational level women that engage in food canteen business because of students who cannot cook. Studies in developing countries have consistently shown that low educational level and lack of employment are the most important factors contributing to street vending entrepreneurship. This study has shown the educational profile of food vendors to be similar to results found in other countries (Chukuezi, 2010 Omemu & Aderoju, 2008). The highest percentage was found among those that attended secondary education (40%) compared to 59.7% in this study. Other studies in Ghana, Nigeria, Kenya, India and Sudan described similar education profiles although tertiary education has not been as high as this Nigerian study for their food vendor population (Donkor *et al.*, 2009; Omemu & Aderoju, 2008). The educational level had significant relationship with knowledge of the respondents on food hygiene.

In a descriptive study conducted by Chukuezi, (2010), the age of the vendors recorded as 28% and 14% between 30-39 years and 40-49 years were not much different to the findings of this study that

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has 44.5% and 14.9% of the food vendors. These ages were seen to be active working age of the respondents. The age of respondents showed significant difference in relation to knowledge.

As regard to the knowledge of food vendors about food hygiene, a good number of the food vendors reported that food hygiene is all about preserving and preparing food to ensure its safety which was the same idea from respondents on studies carried out in Sudan and India, this could be due to training received by food vendors in food preparation (Abdalla *et al.,* 2009; Choudhury *et al.*,2010).

As regard to training, the proportion of untrained (82.8%) food vendors in this study as concerning the knowledge implies that there is no proper monitoring of food vendors within the study area by environmental health inspectors from the local government or State ministry on food preparation despite a regulation on training being in existence in the State and Federal level. It also means that some food vendors have not been certified or registered with the LG Council to prepare and sell food without undergoing any training. The findings of this study is slightly better than the findings of two studies conducted by Chukuezi (2010) in Nigeria in which he investigated the food safety knowledge and practices of street food vendors in two different geographical locations and reported that only 5% of food vendors had been exposed to formal training whereas Omemu & Aderoju (2008) findings established it at 12% of food vendors.

The WHOs Five Keys to Safer Food (WHO, 2007) are recognized as a standard way of producing and maintaining safe food. Maximum adoption of these food safety keys and their associated behaviors ensure consumer protection against food health hazards (WHO, 2007). Majority of food vendors in this study have knowledge of these principles (5 Keys to Safer Foods) such as Key 1 (Keep Clean), which relates to general cleanliness and hand washing, majority of them knew that hand washing was important. In relation to Key 2 (separate raw and cooked food), they knew that raw and cooked food should be stored separately in the refrigerator, when looking at the critical temperature issues covered by Key 3 (Cook food thoroughly) and Key 4 (Keep food at safe temperatures), they knew that cooked food should not be left out of the fridge overnight and knew that cooked foods should be served hot.

The feacal-oral route is recognized as the most important mode of transmission for pathogenic microbes from food handlers to food before consumption (WHO, 1994). Source of water supply was majorly from borehole but some still make use of well water which could stand as good source of food contamination. Additionally, hand washing, utensil washing and surface cleaning would also be hazardous if water perceived to be clean was not used.

As regard to waste disposal practice in the food premises, majority of them practice open dumping and burning because waste management in Nigeria has not really gone beyond open dumping and burning method due to low level of technology and untrained environmental health officers.

It is important that food should be covered to protect it from hazards exposure (Muinde & Kuria, 2005). In Sudan, Abdalla *et al*., (2009) found that 38% of vendors sold food without cover. Based on observations, this study found that food vendors had poorly covered food items being served to the public. Chukuezi (2010) reported similar findings with 10% of the vendors storing food for serving in open places. He furthermore found that 43% did not use aprons and 52% wore no hair covering and they are not too far from the observation of this study where the ideas of food protection were poorly applied. A study by Muinde & Kuria, (2005), found that 81.3% of the vendors did not use aprons and 65% did not cover the hair. In a study conducted in Bloemfontein in 2006, 71% of street food vendors observed wore head coverings during food preparation (Leus *et al.*, 2006). In contrast to the above findings, this study revealed that food vendors were not on a complete hygiene practice. The low proportion of food vendors wearing aprons and head coverings may be due to a cultural norm or value that requires food to be handled with an apron and head covering. Additionally, head coverings may be as a result of certain cultural requirements requiring the heads of married women to be covered.

Conclusion

Food vendors are very important unit of human life in most cities. They are regarded as potential conduits of food borne disease as a result of the conditions in which food is prepared. From the researcher's point of view, the knowledge and practice of the food vendors on cleanliness of environment was fair; inspection of food vendors by environmental health officers was poor and general cleanliness and application of food safety principles among food vendors were poor. It can be

concluded that these food vendors have limited training which affects knowledge and practice of food principles required to ensure food safety and that could reduce the risk of morbidity and mortality due to food-borne diseases.

Table 1. Socio-demographic characteristics of the respondents

Variables	**Frequency N= (221)**	**Percentage (%)**
Gender of the respondents		
Male	55	25
Female	166	75
Total	221	100.0
Age of the respondents		
< 20 years	6	2.7
20-29 years	55	24.9
30-39 years	99	44.8
40-49 years	33	14.9
50-59 years	17	7.7
60 and above	11	5
Total	221	100.0
Educational level of the respondents		
None	0	0
Primary	61	27.6
Secondary	132	59.7
Tertiary	28	12.7
Total	221	100.0

Table 2. Knowledge of respondents on food hygiene

Variables	**Frequency**	**Percentage**
Key to safe food include all except		
Keep surface clean	0	0
Separate raw from cooked food	17	7.7
Cooked food thoroughly	39	17.6
Use safe water	11	5
Cook with salt	154	69.7
It is important to prepare food safely because		
Safely prepared food looks better	0	0
Safely prepared food tastes better	11	5
Safely prepared food prevents food poisoning	204	92.3
Safely prepared food is cheaper	0	0
Safely prepared food is easily digested	6	2.7
The aim of food hygiene practice		
Reduce foodborne illness	160	72.4
Increase food contamination	10	4.5
Make food taste better	22	10.0
Make food digest faster	17	7.7
Make food look better	12	5.4
Protective wears to reduce the risk of food contamination include all except		
Disposable gloves	23	10.4

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Apron	6	2.7
Head gear	10	4.5
Handkerchief	133	60.2
Mouth mask	49	22.2
Reason for keeping raw and cooked food separately		
To prevent food contamination	166	75.1
To make food more palatable	18	8.1
To preserve food nutrients	11	5.0
To increase food shelf life	20	9.1
To sustain food taste	6	2.7
Part of the refrigerator that is best for storing raw meat		
At the top	51	23
In the middle	41	18.6
At the bottom, below all other foods	89	40.3
Drawer of the refrigerator	40	18.1
Refrigerator door	0	0

Table 3. Age of respondents in relation to knowledge of food hygiene

Age groups	**Had Good knowledge**	**Had Poor knowledge**	**Total**	**X^2**	**P-Value**
< 20 years	4(67%)	2 (33%)	6 (2.7%)		
20-29 years	48(87%)	7(13%)	55(24.9%)		
30-39 years	90(90%)	9(10%)	99(44.8%)		
40-49 years	30(91%)	3(9%)	33(14.9%)		
50-59 years	10(59%)	7(41%)	17(7.7%)		
60 and above	9(81%)	2(19%)	11(5%)		
Total	191(86.4%)	30(13.6%)	221(100%)	15.53	0.008

Table 4. Multivariate regression analysis

		Knowledge of food hygiene		**Total**
		Had good knowledge	**Had poor knowledge**	
Age of Respondents	<20 years	4	2	6
	21-29 years	48	7	55
	30-39 years	90	9	99
	40-49 years	30	3	33
	50-59 years	10	7	17
	60 years above	9	2	11
Total		191	30	221

The multivariate regression analysis (R^2) = 0.622 on knowledge of food hygiene and different age groups of the respondents at p-value of 0.05.

Table 5. Gender of respondents in relation to knowledge of food hygiene

Gender	**Have Good knowledge**	**Have Poor knowledge**	**Total**	**X^2**	**P-Value**
Male	37(67%)	18(33%)	55(25%)		
Female	106(68%)	60(32%)	166(75%)		
Total	143(65%)	78(35%)	221(100%)	0.21	0.646

Table 6. Educational level of respondents in relation to knowledge of food hygiene

Educational Level	Had Good knowledge	Had Poor knowledge	Total	X^2	P-Value
None	0(0%)	0(0%)	0 (0%)		
Primary	40(65%)	21(35%)	61(27.6%)		
Secondary	82(62%)	50(38%)	132(59.7%)		
Tertiary	21(75%)	7(25%)	28(12.7%)		
Total	143(64.7%)	44(35.3%)	221(100%)	3.43	0.331

Table 7. Attendance of routine medical examination by respondents and visitation of environmental health workers

Variables	Yes	No	Total
Do you go for routine medical examination?	51(23.1%)	170(76.9%)	221(100%)
Have environmental health workers visited the food premises	33(14.9%)	188(85.1%)	221(100%)

Table 8. Personal food hygiene practices of respondents

Variables	Always	Often	Seldom	Never	Total
Washing hands before cooking	133(60.2%)	73(33%)	11(5%)	4(1.8%)	221(100%)
Washing of food items before cooking	138(62.4%)	78(35.3%)	5(2.3%)	0(0%)	221(100%)
Wearing of Apron while serving food	31(14%)	62(28%)	84(38%)	44(20%)	221(100%)
Wearing of head gear while serving food	28(13%)	40(18%)	98(44%)	55(25%)	221(100%)
Cleaning cooking surfaces	115(52%)	91(41%)	15(7%)	0(0%)	221(100%)

Table 9. Food hygiene practices of respondents

Variables	Frequency	Percentage
Storing leftover food		
Fridge	144	65.2
Reheating and covering	77	34.8
Salting	0	0.0
Drying	0	0.0
Total	221	100.0
Source of water supply		
Borehole	139	62.9
Well water	5	2.3
Commercial water tanker	77	34.8
Stream	0	0
Total	221	100.0
Method of refuse disposal		
Burying	29	13.1
Open dumping	111	50.2
Burning	62	28.1
Waste disposal vehicles	19	8.6
Total	221	100.0
Means of disposing liquid waste		
Pit latrine	29	13.1
Open defecation	66	29.9

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Water cistern	122	55.2
Bucket latrine	4	1.8
Total	221	100.0

Table 10. Age of respondents in relation to practice of food hygiene

Age of Respondents * Practice of hand washing before cooking							
			Practice of hand washing before cooking				**Total**
			Always	**Often**	**Seldom**	**Never**	
Age of Respondents	<20 years	Count	6	0	0	0	6
		Expected Count	3.6	2.0	.3	.1	6.0
	21-29 years	Count	55	0	0	0	55
		Expected Count	33.1	18.2	2.7	1.0	55.0
	30-39 years	Count	72	27	0	0	99
		Expected Count	59.6	32.7	4.9	1.8	99.0
	40-49 years	Count	0	33	0	0	33
		Expected Count	19.9	10.9	1.6	.6	33.0
	50-59 years	Count	0	13	4	0	17
		Expected Count	10.2	5.6	.8	.3	17.0
	60 years above	Count	0	0	7	4	11
		Expected Count	6.6	3.6	.5	.2	11.0
Total		Count	133	73	11	4	221
		Expected Count	133.0	73.0	11.0	4.0	221.0

Statistical tool X^2= 308.4; Df = 5; P-value = 0.001

Table 11. Gender of respondents in relation to practice of food hygiene

Sex of respondents * Practice of hand washing before cooking							
			Practice of hand washing before cooking				Total
			Always	Often	Seldom	Never	
Sex of respondents	Male	Count	55	0	0	0	55
		Expected Count	33.1	18.2	2.7	1.0	55.0
	Female	Count	78	73	11	4	166
		Expected Count	99.9	54.8	8.3	3.0	166.0
Total		Count	133	73	11	4	221
		Expected Count	133.0	73.0	11.0	4.0	221.0

Statistical tool X2= 48.45; Df = 1; P-value = 0.001

Table 12. Educational level of respondents in relation to practice of food hygiene

Educational Level of Respondents * Practice of hand washing before cooking							
			Practice of hand washing before cooking				Total
			Always	Often	Seldom	Never	
Educational Level of Respondents	None	Count	1	0	0	0	1
		Expected Count	.6	.3	.0	.0	1.0
	Primary	Count	60	1	0	0	61
		Expected Count	36.7	20.1	3.0	1.1	61.0
	Secondary	Count	72	59	0	0	131
		Expected Count	78.8	43.3	6.5	2.4	131.0
	Tertiary	Count	0	13	11	4	28
		Expected Count	16.9	9.2	1.4	.5	28.0
Total		Count	133	73	11	4	221
		Expected Count	133.0	73.0	11.0	4.0	221.0

Statistical tool X2= 161.64; Df = 3; P-value = 0.000

Table 13. Researcher's observation of the food vending premises

Variables	Good	Fair	Poor	Total
Cleanliness of environment of food vending	62(28.1%)	139(62.9%)	20(9%)	221(100%)
Washing of cooking utensils	20 (9%)	45 (20.4%)	156(70.6%)	221(100%)
Presence of waste bin	29(13.1%)	111(50.2%)	81(36.7%)	221(100%)
Covering of food items	21(9.5%)	70(31.7%)	130(58.8%)	221(100%)
Wearing of hand jewelry	21(9.5%)	129(58.4%)	71(32.1%)	221(100%)
Food vendors nails	20(9%)	146(66.1%)	55(24.9%)	221(100%)
Covering of hair	18(8.1%)	32(14.5%)	171(77.4%)	221(100%)
Wearing of apron	15(6.8%)	36(16.3%)	170(76.9%)	221(100%)
Presence of flies	18(8.1%)	127(57.5%)	76(34.4%)	221(100%)
Reheating of food before sale	29(13.1%)	122(55.2%)	70(31.7%)	221(100%)
Supply of portable drinking water	63(28.5%)	119(53.9%)	39(17.6%)	221(100%)

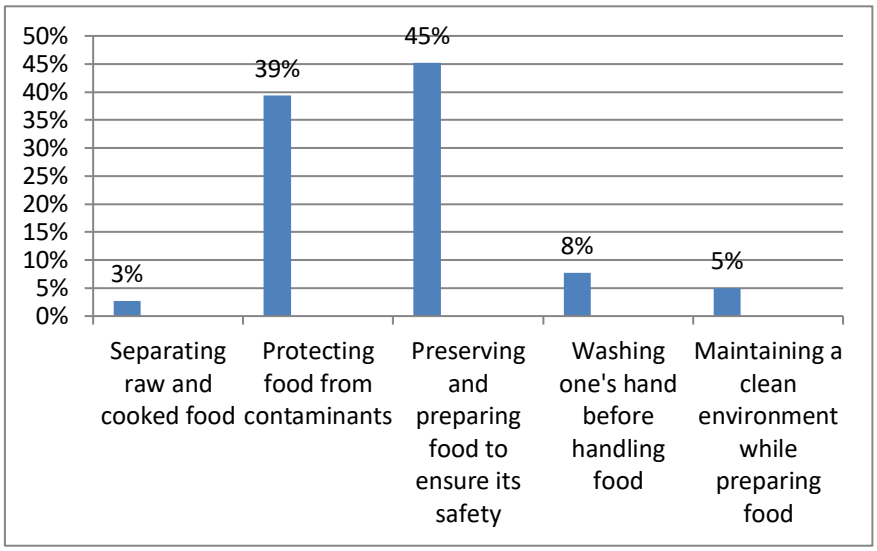

Figure 1. Meaning of food hygiene

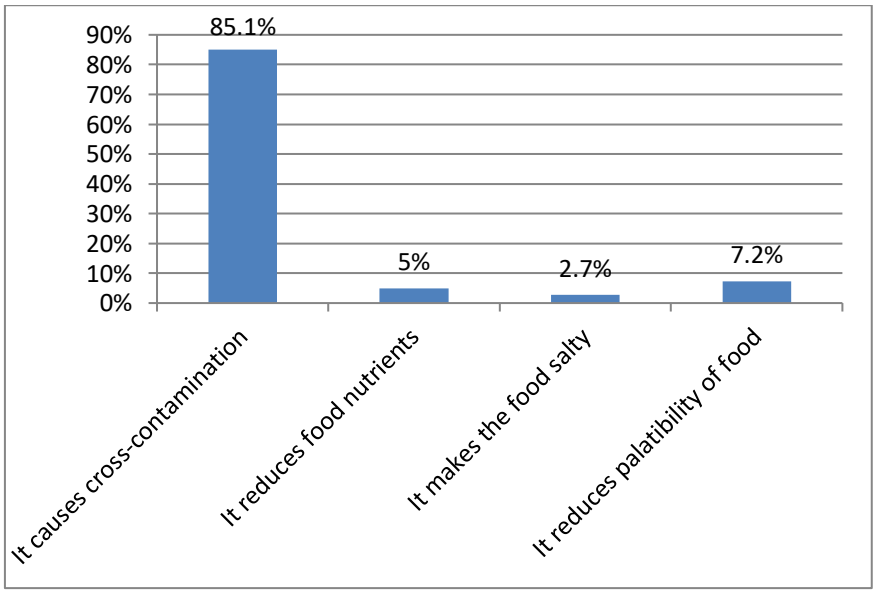

Figure 2. Using the same cutting board/tray between raw and cooked foods

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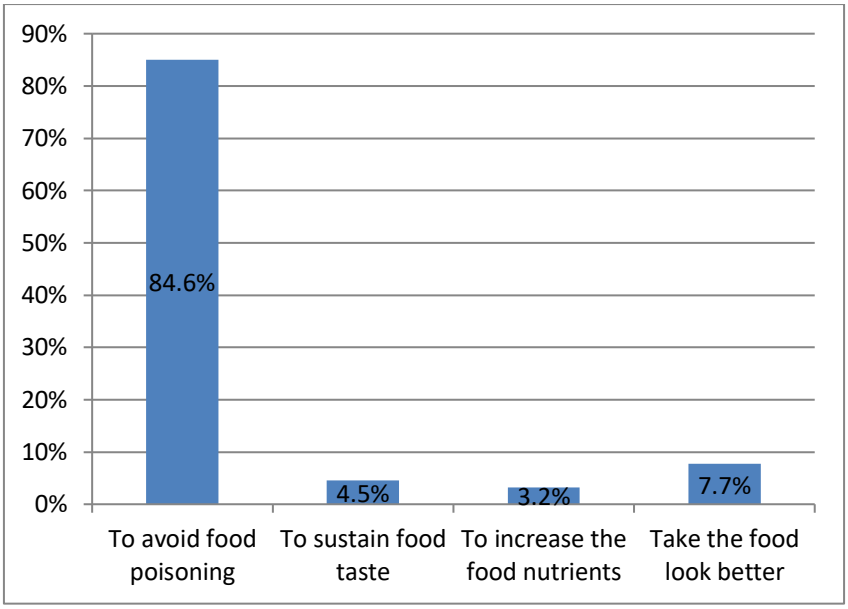

Figure 3. Reason for reheating cooked food

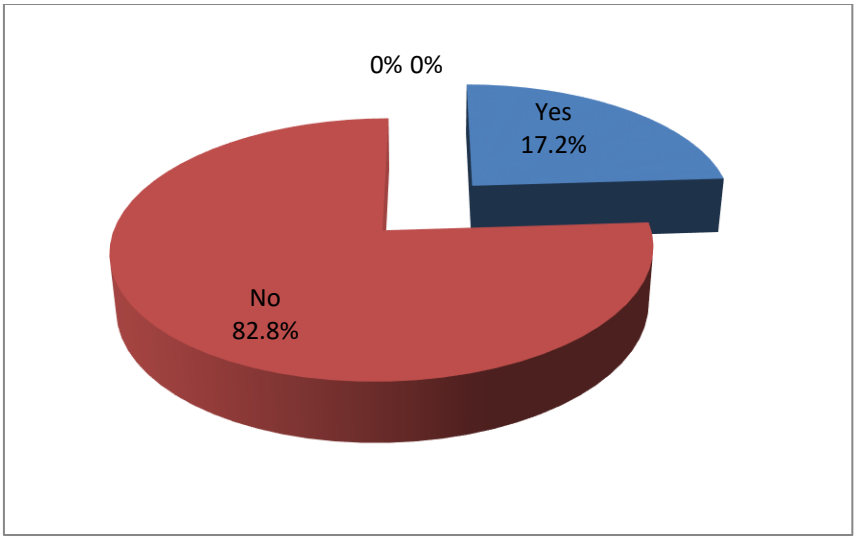

Figure 4. Respondents that have attended food hygiene seminar /workshop/training

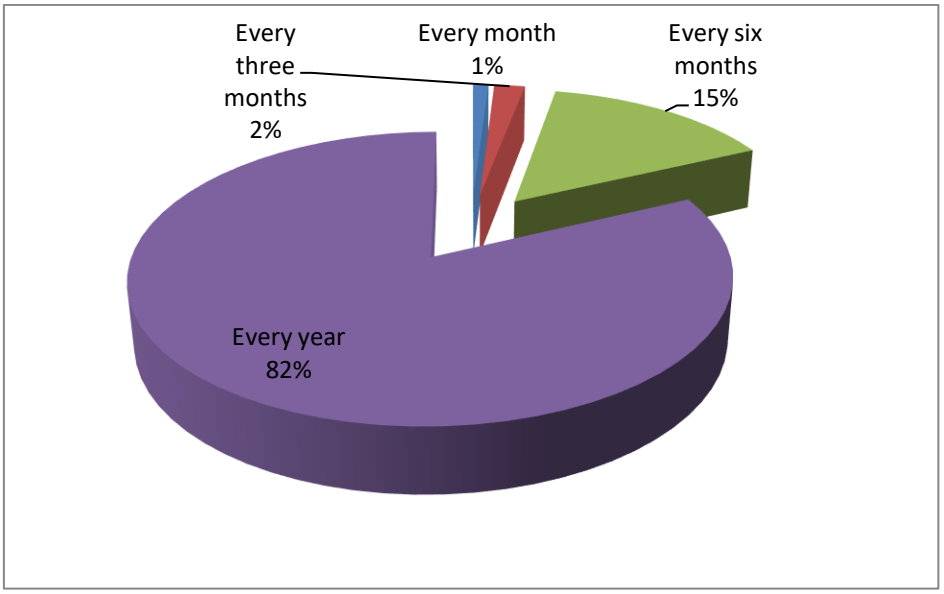

Figure 5. Period of environmental health officers visit to food premises

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