FOOD PREPARATION AND PRESERVATION BY FOOD HANDLERS AND FOOD SANITATION IN ABIA STATE

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ABSTRACT

This study assessed food preparation and preservation by food handlers and food sanitation in abia state. The study adopted a cross-sectional design. The LGAs selected were allocated different percentage of questionnaire samples based on the population such as Aba North (26.0%), Aba South (16.2%), Osisioma (22.4%), Ugwunagbo (20.5%) and Obingwa (14.9%). Structured questionnaire based on Hazard Analysis and Critical Control Point (HACCP), Standard Operating Procedures (SOPs), Food Safety Checklist administered by trained interviewers was used as instrument for this cross sectional study. Meat samples were collected from meat handlers using swab method. Statistical Package for Social Sciences (SPSS) version 22 was used for the statistical analyses while mean statistics and Analysis of Variance (ANOVA) were the statistical tools used for the work. The results of the study proved that food handlers with 11-15 years of experience had the mean scores of 37.82± 1.25% 16-20 years had 37.75 ± 0.10%, 1-5 had 37.59± 2.39% 6-10 years had 37.31± 2.83%. The difference are not statistically significant $F(3,549) = 1.655$, $\rho = 0.192$. The result also revealed that people with no formal education had the height means scores of 38.05± 0.57%, followed by Tertiary Institution which had 37.58± 2.09%, Secondary had 37.45± 2.57% then Primary Education 37.50± 2.49% Post graduates differences are statistically significant $F(4,549) = 6.129$, $\rho = 0.000$. It was also concluded that there is statistically significant difference in the level of Education of food handlers in Abia State. One of the recommendations was that urgent and concerted action should be taken by the government, organizations and individuals to embark on risk assessment of the microbes found in meat and other food substances.

KEY WORDS: **Food hygiene practices, food handlers, personal hygiene, food sanitation, years of experience, level of Education, Abia State**

INTRODUCTION

According to European Union (2005), food hygiene refers to all measures necessary to ensure the safety and wholesomeness of foodstuffs. Food hygiene is the practice of following certain rules and procedures to prevent the contamination of food, keeping it safe to eat. Amadi (2011) believes that the practice of food hygiene is recommended at every step of the supply chain within the food industry, from workers in crop fields to waiters at restaurants. Therefore, food hygiene is an Environmental Health requirement. The activities include the inspection of food preparation, inspection of premises prior to commencement of operation, licensing of the food premises after satisfaction of the minimum requirement for such a license, ensuring that the food handlers are medically fit to handle food meant for public consumption etc. Food hygiene typically refers to rules and procedures within the food industry, whether during production,

packaging, transporting or serving at the consumer level, such as in a home kitchen. Food hygiene ensures that food is uncontaminated and safe to eat.

In Nigeria as a whole and in Abia State in particular there are laws governing food hygiene and safety practices which are called Public Health Laws. Public Health Laws can be defined as body of statutes, regulations and precedents that has for its purpose the protection and promotion of the individual and community Health. There are different types of Public Health Laws for food hygiene and safety enacted as Acts, Decrees, Laws, Edicts and Byelaws. These include the Public Health Laws of Abia State cap. 38 of 1999 (s.12 inspection of food and condemnation of food); Abia State Environmental Sanitation Law 38(s. 11 (2) inspection of Restaurants, drinking houses, abattoirs, shops, factories) all enforceable National, State and Local Government Byelaws on public health with regards to food hygiene and safety. .The essence of these laws is to ensure protection of food to prevent mortalities and morbidities arising from consumption of unwholesome food.

The safety of the food supply is another issue that has drawn the interest of people over the years because most people have poor knowledge and practice in food safety (Okoli, 2006). This is the reason millions of people get sick from the food they eat and that is why it is important we keep the food supply relatively free of harmful substances, such as some chemicals used to grow and process foods. Food safety refers to the conditions and practices that preserve the quality of food to prevent contamination and food-borne illnesses. According to Omotayo and Denloye (2002), food safety is a vital issue both in developed and developing countries; given that food borne illnesses contribute to millions of illnesses and thousands of deaths annually. Food safety is a key public health priority, because a large number of people take their meals outside the home. As a result, they are exposed to food borne illnesses that originate from food stalls, restaurants and other food outlets. Food service employees are a crucial link between food and consumers.

STATEMENT OF THE PROBLEM

Food safety is a significant and growing public health problem in Nigeria and food-borne disease is an important contributor to the huge burden of sickness and death caused by Diarrhea. The Federal Ministry of Health reported 90,000 cases of food poisoning in 2007, which is certainly a gross underestimate. The World Health Organization (WHO) estimated that 200,000 people die from diarrhea each year in Nigeria (WHO 2008), as much as 70% of which may be attributable to contaminated food and water. Mobility and mortality resulting from insanitary food handling is a major public Health problem in Nigeria. Statistics has shown that diarrhea cases account for 25% of mortality (FAO/WHO 2002) Therefore. this study is commissioned to address insanitary handling of food in Abia State because not many researchers have conducted research in this discipline. Therefore, this study is conducted to address unsanitary and unhygienic food handling in Abia State in order to reduce the prevalence of food borne diseases occasioned by poor food handling.

SPECIFIC OBJECTIVES

1. To determine the methods of food preparation among food handlers in Abia State in compliance with the HACCP-SOPs.
2. To find out the differences in the mean food preservation/storage by food handlers in Abia State.

RESEARCH QUESTIONS

1. What methods of food preparation do food handlers employ in compliance with the HACCP-SOPs in Abia State?
2. What means of food preservation/storage do food handlers adopt in Abia State?

HYPOTHESES

1. H_0: There is no statistically significant difference in methods of food preparation by food handlers and food sanitation in compliance with the HACCP-SOPs in Abia State
   H1: There is statistically significant difference in methods of food preparation by food handlers and food sanitation in compliance with the HACCP-SOPs in Abia State.
2. H_0: There is no statistically significant difference in the mean food preservation/storage by food handlers and level of education
   H1: There is statistically significant difference in the mean scores of food handlers in Abia State on the HACCP-based SOPs Checklist by their level of education.

LITERATURE REVIEW

METHODS OF FOOD HANDLING

Everyone has bacteria on their bodies; even healthy people can spread bacteria into food by touching it with their hands. Therefore, it is necessary to thoroughly wash and dry hands before handling food, between handling raw food and cooked or ready-to-eat food. Also use sanitized utensils (tongs, spoons, spatulas) to handle cooked or ready-to-eat food. The followings are some methods of food handling:

Gloves: Use disposable gloves when handling food. The same precautions are taken when handling raw food and cooked or ready-to-eat foods. Hands should be washed and dried thoroughly before putting on gloves, and always use fresh gloves. Always change the gloves at least once every hour, if they become contaminated, if they tear, when switching between handling raw and ready-to-eat foods, when changing tasks, after taking rubbish out, after sweeping, mopping and cleaning.

Cooling food: Just cooked foods should not be left out to cool for more than one hour. As soon as food has cooled, place it in the refrigerator or freezer. Large portions of food cool faster if divided into smaller quantities. Keep frozen food frozen solid during storage.

Thawing frozen food: Thaw food thoroughly before cooking. Bacteria can grow in frozen food while it is thawing, so food should be kept out of the frozen Temperature Danger Zone. Thaw frozen food on the bottom shelf of the refrigerator, and keep it in the fridge until it is ready to be cooked. If using a microwave oven to thaw food, cook it immediately after defrosting. If you have to cook food that is still frozen, make sure that the food is cooked right through, and that its core temperature reaches 75°C. Avoid re-freezing thawed food. Bacteria do not die when food is refrozen and are still there when the food is thawed.

Packing and serving prepared food: Store food in clean, non-toxic food storage containers which are strong enough for the job. Wash and sanitize containers before using them. Do not re-use containers that are only meant to be used once. When serving food, make sure that all cutlery and crockery is clean and undamaged.

Proper Storage of Cooked and Uncooked Food

Refrigeration slows bacterial growth and prolongs the freshness of food. Bacteria grow most rapidly between 5^oc and 60^oc, a temperature range known as the 'Temperature Danger Zone'

ILRI (2011) recommended that refrigerating food quickly after cooking can help keep the bacteria from multiplying. Cooking food to proper temperatures kills most bacteria, including *Salmonella, Listeria,* and all kinds of *E. coli* that cause illness, and Parasites. Ho
wever, cooking does not kill most harmful bacteria; it is especially important when a pathogen is hard to wash off a particular kind of food, or if a bacterium can grow at refrigerator temperatures, as is true of *Listeria monocytogenes* and *Yersinia enterocolitica.* Hence, it is important to maintain the correct temperature of refrigerators and to keep them clean so that frozen and chilled food remains safe.

METHODS OF FOOD PRESERVATION

Food preservation and storage methods in Abia may be poorly conceived and inadequate. This may have resulted to enormous food losses in storage as a result of deterioration by microorganisms, rot and rodents. Abia State is blessed with different types of food produce and also possesses diverse indigenous knowledge systems for their preservation and storage. These have been used by most food handlers over time to preserve their produce after harvest. Traditionally, Long-term methods like fermentation and drying have been used for fruits and vegetables, while short term methods used include storing in buckets and in clay pots; and also blanching (FAO/WHO, 2002). For grains, storage in cribs and silos is practiced. Traditional ways of storing yam include keeping them fresh in barns, on platforms or in the ground. However for cassava, being a highly perishable crop, methods like re-burying in trenches; applying a thick coat of soft clay or mud; or keeping small quantities in water have been used for short-term storage (Alakija, 2002).

Improved methods of preservation and storage available for cassava include the field clamp method; storage in boxes or in plastic film bags with various lining materials. According to Igwe and Abia (2004), the non-adoption of new methods by the food handlers slows down improvements that have been made through research. Collaborations incorporating the plus aspects of the present methods with research into new ways of food preservation and storage are advocated in other to save more food for the future.

According to Onuzulike (2005), the following rules should be followed when handling food in order to prevent contamination: Select fresh vegetables and fruits, Use all perishable food on time especially when there are no facilities for storage such as refrigerator, Foods that have changed from their natural odour, colour, texture and physical properties should not be purchased or consumed, All foods must be covered with fitting lids, Do not purchase canned foods that have dented or container swollen in, and Left over foods/soup should be boiled properly before consumption.

Advanced Method of Food Preservation Techniques

Methods such as canning, pickling, drying and freeze-drying; irradiation, pasteurization, smoking, and the addition of chemical additives or spices etc., are also used in Abia State but these methods are usually not affordable for the less privilege.

Canning: Canning is the process of applying heat to food that is sealed in a jar in order to destroy any microorganisms that can cause food spoilage. Proper canning techniques stop this spoilage by heating the food for a specific period of time and killing these unwanted microorganisms. During the canning process, air is driven from the jar and a vacuum is formed as the jar cools and seals. The United States Department of Agriculture (USDA) approved two methods of canning; these are water-bath canning and pressure canning.

Drying: Drying is the oldest method known for preserving food, but when you dry food, you expose the food to a temperature that is high enough to remove the moisture but low enough that it does not cook. Good air circulation assists in evenly drying the food. An electric dehydrator is the best and most efficient unit for drying or dehydrating food, which includes a thermostat and fan to help regulate temperatures much better. You can also dry food in your oven or by using the heat of the sun, but this process will take longer time and produce inferior results to food dried in a dehydrator.

Irradiation: Popular method for preserving fish in tropical countries is to dry it under the sun. After irradiation with sterilizing doses, these foods can be stored without refrigeration for years. Infestation by several species of flies occurs during drying and gives rise to heavy losses during storage and marketing. Maggots may be found in dried fish only 3 days after drying. Applying insecticides directly to the fish, either during sun-drying or storage, had been used as the only fly dis-infestation method before the problem of chemical residues was recognized. Besides insect infestation, moulds, bacteria, rancidity, and discoloration are the main causes of spoilage and deterioration in quality of dried fish.

Pickling: Pickling: this is also known as brining or corning, it began as a way to preserve food for out of season use and long journey. Is the process of preserving food by anaerobic fermentation in brine (a solution of salt in water) to produce lactic acid, or marinating and storing it in an acid solution, usually vinegar (acetic acid). The resulting food is called a pickle. This procedure gives the food a salty or sour taste. The addition of salt suppresses undesirable microbial activity, creating a favorable environment for the desired fermentation. Pickling preserve most green vegetables and fruits for months, it is another method of chemical preservation. Pickling may also improve the nutritious value of food by introducing B vitamins produced by bacteria.

Pasteurization: the process of pasteurization was named after Louis Pasteur who discovered that spoilage organisms could be inactivated in wine by applying heat at temperatures below its boiling point. This process was later applied to milk and remains the most important operation in the processing of milk, is a thermal process used to eliminate specific pathogenic microorganisms from food which involve heating a food, usually liquid, to a specific temperature (below boiling point) for a definite length of time, and then cooling it immediately. This process slows microbial growth in foods and is not intended to kill all micro-organisms in the food; instead it aims to reduce the number of viable pathogens so they are unlikely to cause disease. Heinz and Hautzinger (2009) said there are basically two methods of pasteurization in use today namely the Batch method and the Continuous flow process.

MATERIALS AND METHODS

Study Design

Cross sectional study design was adopted for this work. Simple random sampling was employed.

Population of the Study

Aba, the study city, has a population of about 932,411 (Nigeria population census, 2007). It is the commercial nerve centre of Abia State, which has three main international markets – Ariaria Market, New Market/Ekeoha Shopping Centre and Cemetery Market. Apart from these main commercial centers the whole of Aba is filled with many small markets and industries.

Sampling
Random sampling was used for collection of biological samples for this study and has been accepted by ILRI 2011. 144 samples were collected from 6 markets sampling for administration of HACCP base SOP check list was done using a modified method of ILRI (2011).

Selection of Meat Markets and Abattoir
A number of markets exist in Aba, but six markets were randomly selected by ballot method. The markets selected from Aba were; waterside market, AhiaUmungasi, AmaOgbonna market, AhiaUdele, AhiaOhuru and cemetery market. The abattoir selected for this study was the main slaughter house in Ogbor-Hill located in the center of the city in Aba.

Meat Sampling at the Abattoir
The abattoir comprises several butchering stalls which were randomly selected, using the ballot method. 24 samples from different portions of fresh meat were aseptically collected from each market. A total of 144 meat samples were collected in all the meat market. While 28 samples each were collected from Raw and cooked foods respectively making a grand total of 200 samples.

Meat Sampling At the Markets
The meat stalls in a market were numbered and sequentially arranged. The balloting techniques were employed to select the meat stalls. In each market, 24 samples from different portions of fresh meat were selected.

Sampling Of Contact Surface at the Market and Abattoir
Five surface swab samples of each of the meat seller's knives, tables and hands were aseptically collected using the swabbing technique. 75 swab samples were collected from the markets while 15 swab samples were collected from the abattoir. Collection was dependent on the size of the market as well as on the cooperation of the meat sellers. A total of 90 swab samples were collected in all the meat markets.

Instrument for Data Collection
Instruments used for data collection in this study were; interviews, Questionnaire, microbial analysis,

Reliability of the Instrument
To test for the reliability of the two research instruments, Kuder Richardson techniques were used. The technique was used to ascertain the level of reliability of the researcher instrument named 'ASSESSMENT OF FOOD PREPARATION AND PRESERVATION', QUESTIONNAIRE (AFPPQ)).

Sampling Procedure
The samples were collected in twelve successive visits to the abattoir and to each of the market. The ICMSF sampling procedures were used. Sterile swabs for taking surface swab samples were used. The sampling areas were marked with sterile metal guide (e.g. 5, 50 or 100cm^2). Two sterile cotton swabs were used to swab the sample area. The first swab was moistened with peptone water and rubbed firmly across the exposed area several times in all direction. The second swab was used to dry by rubbing over the same area. The swabs were introduced into

bottles containing 0.1% peptone water and vigorously shaken. The samples were kept in labeled bags and kept at 4^{o}C in an insulated cooler box while transported to the laboratory for further bacteriological analysis within two hours.

Sample Preparation

The sampling procedure was used. Two sterile cotton swabs was used to swab the sample area marked with sterile metal guide (e.g. 5, 50 0r 100cm^2). The first swab was moistened with peptone water and rubbed firmly across the exposed meat area in all direction. The second swab was used to dry by rubbing over the same area. The meat was held and cut open with a sterile spatula and scissors and the procedure was repeated. The swabs was pooled together into a bottle containing 0.1% peptone water and vigorously shaken and kept for further analysis.

Microbiological Analysis

The microbiological analysis was carried out in Abia State Teaching Hospital, Aba. The sample was cultured using pour plate method. All media used were prepared according to the manufacturer's instruction and sterilized at 121^{oc} for 15 minutes. From the 10 fold dilutions of the homogenates, 0.1 ml of 10^{-6}dilution was plated in replicate on nutrient agar for total viable aerobic bacteria and MacConkey for Staphylococcus .and Esherica Coli, coliform enumeration. The plates were incubated at 37^{oc} for 24 hours. After the incubation time, the plates were observed for countable colonies formed. The colonies were counted using digital colony counter. The counts were expressed as cfu/cm^2.

Total Viable Bacteria Count

The nutrient agar medium was prepared by dissolving 28g of the nutrient agar powder in 1000ml of distilled water sterilized by autoclaving at 121^{oc} for 15 minutes. It was dispensed in sterile Petri-dishes and cooled to 45 ^{oc}. 0.1ml of each sample was pipette into Petri-dishes; 20ml of the molten nutrient agar was later added aseptically. The Petri-dishes were rotated gently to distribute the bacterial cells evenly in the agar. The agar was allowed to cool and set (approximately 20 minutes). The plates were incubated at 37^{oc} for 24 hours. The plates were observed and the colonies formed were counted as cfu/cm^2 (Okonko et al., 2010).

Total Coliform Counts

The MacConkey agar medium was prepared by dissolving about 26g of the powder in 500ml of distilled water, sterilized by autoclaving at 121^{oc} for 15 minutes and cooled to 45 ^{oc}. From the ten-fold dilution, 0.1ml of 10^{-6} was pipette into Petri-dishes and 20ml of MacConkey agar was aseptically added. The petri dishes were rotated gently to distribute the bacterial cells evenly in the agar. The agar was allowed to cool and set. The plates were incubated at 37^{oC} for 24-48 hours, and colonies formed were counted and expressed as cfu/cm^2.

Isolation of Bacteria Isolates

Following the establishment of growth in the cultured samples, each culture plate was examined closely for the presence of distinct colonies. From such distinct colonies, inoculate were collected aseptically and transferred unto fresh nutrient agar media as sub-cultures. Upon the establishment of growth, the culture plates were examined for uniformity as a mark of purity.

The resulting pure cultures were used for characterization of the isolates and their subsequent identification (Okonko et al., 2010).

Identification of Bacterial Isolates

The resulting pure cultures was carefully examined and characterized based on colony morphology, microscopic appearance, gram staining reaction and biochemical tests such as TSI test, ureas test, indole production, methyl red(MR), voges-proscauer(VP), motility, citrate test as described by Okonko et al., (2010).

Colony Morphology

The bacteria isolates was then identified based on matching characteristics with existing taxonomy using Bergery's, manual of determinative bacteriology.

Morphological and Biochemical Characteristics of Bacterial Isolates

Although the above named characters of the colony would be a pointer to the type of the bacterium, further tests are required for actual identification. Therefore, a stained preparation of the bacterium was made. The smears from isolated colonies were stained and examined under the microscope. A staining reaction was carried out for bacterial differentiation.

Gram Staining Reactions

Gram staining reaction has the wildest application, distinguishing nearly all bacteria as gram's positive or gram's negative according to whether or not they resist discoloration of methyl violet and subsequent treatment with iodine. A smear of the culture made on clean grease-free slide with a flamed inoculating loop. The film was air dried by waving it around for a while. The smear was heat fixed by waving it over a Bunsen flame. The slide was placed on a rack over a sink. The smear was covered with crystal violet reagent for 1 minute, rinsed in slowly running tap for 30-60 seconds. It was drained and was washed with lugol's iodine for 60 seconds. The slide was washed gently under the tap to drain off the iodine. The slide was washed in 95% ethanol until the slide appears free of violet stain. The slide was rinsed under the tap and flooded with safranin for 30 seconds. The slide was drained, washed and blotted dry.

Data Analysis

The data was analyzed using appropriate statistical techniques. For research question descriptive statistics (percentage analysis) was used to answer it while independent t-test analysis and one-way analysis of variance were used to test the hypothesis at 0.05 alpha level. Data were statistically analyzed using SPSS version 20.

RESULTS AND DISCUSSION OF FINDINGS

Inferential Statistics (Research Questions) and Hypotheses

Research Question 1

What methods of food preparation do food handlers employ in compliance with the HACCP-SOPs by their years of experience in Abia State?

Descriptive

TABLE 1: Percentage score of respondents

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	Minimum	Maximum

					Lower Bound	Upper Bound		
1 – 5	169	37.5979	2.38651	.18358	37.2355	37.9603	26.84	38.60
6 – 10	298	37.3051	2.82614	.16371	36.9829	37.6273	26.84	38.60
11 – 15	77	37.8294	1.25043	.14250	37.5456	38.1133	27.21	38.24
16 – 20	6	37.7451	.18985	.07751	37.5459	37.9443	37.50	37.87
Total	550	37.4733	2.51381	.10719	37.2627	37.6838	26.84	38.60

Table 1 shows that respondents with years of experience 11 -15 had the highest mean score of 37.82 ± 1.25%, 16 -20 years had 37.75 ± 0.19%, 1 – 5 had 37.59 ± 2.39%, 6 – 10 years had 37.31 ± 2.83%.The differences are not statistically insignificant, F(3, 549) = 1.655, ρ = 0.192.

ANOVA

TABLE 2 Percentage score of respondents

			Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	(Combined)		21.267	3	7.089	1.123	.339
	Linear Term	Unweighted	.595	1	.595	.094	.759
		Weighted	.359	1	.359	.057	.812
		Deviation	20.909	2	10.454	1.655	.192
Within Groups			3448.009	546	6.315		
Total			3469.276	549			

Research question 1 which states that to what extent do food handlers in Abia State comply with HACCP SOP check list by their years of experience? Table 1 – 2 answers this question. One way of analysis of variance shows that food handlers with 11-15 years of experience had the mean scores of 37.82± 1.25% 16-20 years had 37.75 ± 0.10%, 1-5 had 37.59± 2.39% 6-10 years had 37.31± 2.83%. The difference are not statistically significant F(3,549) = 1.655, ρ = 0.192. We therefore accept the Ho: which states that there is no statistically significant difference in the scores of food handlers in Abia State by their years of Experience and rejected the alternative Hi which states that there is statistically significant difference in the score of food handlers in Abia State by their years of experience.

Research Question 2

What mean of food preservation/storage do food handlers adopt in Abia State by their level of education?

TABLE 3 Percentage score of respondents

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
None	14	38.0515	.51491	.13761	37.7542	38.3488	36.40	38.60
Primary school	132	37.5084	2.49535	.21719	37.0787	37.9380	26.84	38.60
Secondary school	347	37.4502	2.57206	.13808	37.1786	37.7218	26.84	38.60
Tertiary Institution	56	37.5788	2.09938	.28054	37.0166	38.1410	26.84	38.24
Post-graduate	1	26.8382	.	.	.	.	26.84	26.84
Total	550	37.4733	2.51381	.10719	37.2627	37.6838	26.84	38.60

Table 3 shows that respondents with none formal education had the highest mean score of 38.05 ± 0.51%, tertiary institution had 37.58 ± 2.09%, secondary school had 37.45± 2.57%, then primary school 37.50 ± 2.49%, post graduate 26.84±0.00. The Difference is statistically significant, F (4, 549) = 6.129, ρ = 0.000.

TABLE 4 Percentage score of respondents

			Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	(Combined)		118.755	4	29.689	4.829	.001
	Linear Term	Unweighted	115.930	1	115.930	18.857	.000
		Weighted	5.715	1	5.715	.930	.335
		Deviation	113.040	3	37.680	6.129	.000
Within Groups			3350.521	545	6.148		
Total			3469.276	549			

Research question 2 states "To what extent do food handlers in Abia State comply with the HACCP –SOPs check list by their level of Education? Table 3–4 answer this research question. One-way analysis of variance revealed that people with no formal education had the height means scores of 38.05± 0.57%, followed by Tertiary Institution which had 37.58± 2.09%, Secondary had 37.45± 2.57% then Primary Education 37.50± 2.49% Post graduates differences are statistically significant $F(4,549) = 6.129$, $\rho = 0.000$. We therefore reject the null hypothesis

which states that there is no statistically significant difference and accept the alternative HI which states that there is statistically significant difference in the level of Education of food handlers in Abia State. The differences in score do not show that, the higher the respondents are educated, the higher their scores as the highest score came from those with no formal education while the least of 2% was from postgraduate level.

CONCLUSIONS:

It is concluded that HACCP-SOP check list is not used in Abia State by food handlers. This means that foods are contaminated with microorganisms in the study area leading to cases of diarrhea and death of many food consumers. Also there is no statistically significant difference in the scores of food handlers in Abia State by their years of Experience. It was also concluded that there is statistically significant difference in the level of Education of food handlers in Abia State.

RECOMMENDATIONS

1. The Public should be given health education on HACCP and safety food management using HACCP and food hygiene practices.
2. Food handlers should undergo medical test before serving the people and also go for routine test every year.
3. NAFDAC should be more proactive in ensuring that those food previously licensed and approved are regularly followed up.

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