ASSESSMENT OF FOOD AND MEAT SANITATION IN ABIA STATE

BY

UDO, EDET AKPAN, PhD
DEPARTMENT OF ENVIRONMENTAL HEALTH
COLLEGE OF MEDICAL AND HEALTH SCIENCES,
ABIA STATE UNIVERSITY, UTURU

ABSTRACT

This study assessed food and meat sanitation in different food service establishment in five Local Government Areas (LGAs) of 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 and Microsoft Excel (2010) were used for the statistical analyses while Analysis of Variance (ANOVA) was the inferential statistic. The results of the study showed a statistically significant difference in the scores of the food handlers on the HACCP-based SOPs Checklist which were low by international standards (mean = 37.47±2.51%): Aba South LGA had the highest score (37.98±1.17%), followed by Ugwunagbo (37.97±1.09%), Aba North (37.61±2.25%),Obingwa (37.00±2.30%), and Osisioma (36.80±3.50%), $F(4, 549) = 5.140$, $p = 0.000$.There was also a statistically significant variability in the scores of food handlers in the different food service establishments: Food vendors had the highest score (37.72±1.96%), followed by abattoir workers (37.63±2.38%), Dry food (37.48±2.50), and Fast food (36.53±3.77), $F(3, 549) = 4.004$, $p = 0.008$. To authenticate the low scores of the food handlers on the HACCP-based SOPs Checklist, the mean bacterial load for meat in the studied LGAs were 17.14×10^4 and 1.67×10^4. This is far higher than the limit allowed by the Microbiological Criteria of the Codex Alimentarius Commission of World Health Organization and Food and Agricultural Organization (WHO/FAO) of the United Nations which is 1.00×10^4 or lower. In conclusion, the food hygiene and sanitation are still very much below the internationally recommended standard, providing fertile atmosphere for food borne diseases and outbreaks to thrive in Abia State. The negative impact of these on the health and domestic economy and gross domestic product of Nigeria in this economic depression can prove disastrous. 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, food location, Abia State**

INTRODUCTION

Food has different meanings for different people. People who are starving see food as a means of survival. Amadi (2009) defined food as any substance in the form of solid or liquid that is taken into the body, which nourishes the body, provides energy, builds the body, replenishes worn-out tissues and regulates the body processes. It can also be defined as plant or animal origin that contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals and is ingested and assimilated by an organism to produce energy, stimulate growth, and maintain life (Litchfield, 2000).

Food hygiene means 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. 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. Food operators should implement the listed guidelines to ensure that the food served to public is wholesome and safe for consumption which include: the need for the food handlers and service staff to have awareness on good housekeeping and personal hygiene practices; To know the method to serve food hygienically; To know how to eat safely during festive period and what not to eat during festive period; To know how to store food properly in the refrigerators and the use of refrigerators; thawing of food; Good handling of eggs; Proper cleaning and sterilization of chopping boards and other implements; Proper Handling of raw vegetables and fruits; Prevention and control of rodent and cockroach infestation; Proper hand washing; Safe holding and cooking temperatures for the food; Proper attire for handlers, such as gloves and breathing masks, cap etc.

The Abia State Primary Health Care Management Board was established for enforcement of public health laws with respect to maintenance and regulation of primary health care activities which includes environmental health activities including food hygiene and safety. This involves the Control and regulation of restaurants, bakeries, market places, abattoirs and other places for sale of food to the public (Swedberg, 1994).

STATEMENT OF THE PROBLEM

Mobility and mortality resulting from insanitary food handling is a mayor 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 been 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. 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.

SPECIFIC OBJECTIVES

1. To determine the food hygiene practices by food handlers in Abia State in compliance with the HACCP-SOPs.
2. To determine the level of personal hygiene among food handlers in Abia State in compliance with the HACCP-SOPs.

RESEARCH QUESTIONS

1. To what extent do food handlers practice food hygiene in Abia State in compliance with the HACCP-SOPs?
2. What is the level of personal hygiene among food handlers in Abia State in compliance with the HACCP-SOPs?

HYPOTHESES

1. H_0: There is no statistically significant difference between food hygiene among food handlers and food location in Abia State.
   H_1: There is statistically significant difference between food hygiene among food handlers and food location in Abia State.
2. H_0: There is no statistically significant difference between personal hygiene of food handlers and food sanitation in the study food establishments in Abia State.
   H_1: There is statistically significant difference between personal hygiene of food handlers and food sanitation in the study food establishments in Abia State.

LITERATURE REVIEW

FOOD HYGIENE AND SAFETY

The Government of Nigeria launched the National Policy of Food Hygiene and Safety in 2000 as an integral part of the Nigerian National Health Policy. The overall goal of this policy is the attainment of high level of food hygiene and safety practices which will promote health, control food-borne diseases, minimize and finally eliminate the risk of diseases related to poor food hygiene practices. The policy seeks to stimulate and promote legislations concerning food in areas of production, storage, handling, processing, preservation, trade, transportation and marketing. The national food safety policy is needed to provide assurance that food supplied to the consumers is adequate, nutritious, of good quality and wholesome (Omotayo & Denloye, 2002).

Various government organizations and agencies are responsible for regulating and monitoring food safety standards and practices in Nigeria. These include, the Environmental Health Officers Registration Council of Nigeria (EHORECON), National Agency for Food and Drug Administration and Control (NAFDAC), Federal Ministry of Health, Standards Organization of Nigeria (SON), National Codex Committee, Federal Ministry of Agriculture, States and Local Governments; respectively. For instance the Environmental Health Officers Registration Council of Nigeria (EHORECON) is a major stakeholder responsible for ensuring high standards of personal hygiene of food handlers/vendors, and the wholesomeness of food for human consumption through inspection of small and medium scale food premises, such as canteens, fast food restaurants, road-side restaurants, and street-vented food points. The Environmental Health Officers (EHO) also assess food establishment to ensure food hygiene and safety quality assurance. In order to achieve this objective requires that food vendors/handler should comply with the following basic requirements: (i) Food handlers/vendors should have certificate of medical fitness;(ii) Current certificate of training for food handlers/vendors; (iii) Good general sanitary condition of the premises; (iv) Good

Storage facilities for cooked food items; and (v) Good sources of water supply, storage and distribution.

Other requirements includes adequate waste management system; good personal hygiene of the food handlers; availability of the sanitary facilities; adequate lighting and ventilation; the sanitary condition of cooking utensils; evidence of pest control (including evidence of flies, rats, rat runs, rat droppings etc.). Furthermore, EHO also carry out periodic checks for cleaning of hands (e.g. wash hand basin with running water or individual wash hand basin with disposable towels, etc.); Provision of safety facilities and precautions; evidence of fly proof materials; availability of adequate drainage system and maintenance.

The National Agency for Food and Drug Administration and Control (NAFDAC) is solely responsible for regulating and controlling the manufacture, importation, exportation, advertisement, distribution, sale and use of food, drugs, cosmetics, medical devices, chemicals and pre-packaged water. However, in line with the government policy on Food Hygiene and Safety, the guidelines for food manufacturing plants in Nigeria are mandated to:

- Protect the public against injury to health through the consumption of unwholesome food.
- Restrain the sale of foods which are un-hygienically prepared, adulterated, contaminated, spoilt, and improperly labeled.
- Ensure proper inspection and registration of all food premises.
- Conduct public health surveillance of food premises, food handlers and equipment used for food processing.
- Educate the populace on sound hygiene and safety practices.
- Ensure inter-ministerial and multi-sectional collaborative activities.
- Collaborate with non-governmental organizations and ensure community participation.

Food Sanitation

Food is an indispensable requirement for man's survival, being consumed virtually everywhere – at home, in the school, motor-park, workshop, market, bus, train, office, etc. Food should be wholesome or free from disease-causing organisms and substances. Food can be easily contaminated or rendered unwholesome during any of the various stages of its production: processing, packaging, storage, transportation, preservation, preparation and serving. In that form, it becomes a potent vehicle for the transmission of various types of communicable diseases. Food contamination and pollution can also facilitate the development of non-communicable diseases. Therefore, the hygiene of food handling is a vital aspect of environmental health services, but it has been neglected and not taken seriously by most operators of such business. This accounts for the deteriorating food hygiene situation as seen in many restaurants, fast-food centers, hotels, markets, domestic kitchens and other food handling concerns (Abiola, 1995).

MEAT SELLING OUTLET

Several outbreaks of food poisoning and food-borne diseases have been reported in Aba, and these have been attributed mainly to the consumption of food contaminated as a result of compromised food hygiene practices by food handlers (Amadi, 2009). Such unhygienic practices (which have been accepted as a norm in Aba), include the display for sale, of ready-to-eat food items such as 'Akara', dough-nut, bourns, garden eggs and similar items, without protective covering. Others include: display of food items along dirty open drains or gutters, and the illegal conversion of sanitary lanes to food premises. Pitiable scenes are often seen around dumps of decaying refuse, with swam of flies and people jostling to access and purchase displayed food items. In this way, food items are exposed to gross contamination with heavy loads of disease-causing organisms such as bacteria, viruses, parasites, viable worm ova or dangerous chemicals, due to the activities of flies as well as air movement.

The scenario in the various market places is not quite different, as food materials of all sorts are displayed for sale without any regard to basic hygiene or sanitary rules. The falling standard of food sanitation in Aba therefore demands investigation, with particular attention to markets, since the health of the trading public is directly or indirectly affected. This is necessary in order to identify the cause of this problem and to suggest possible solution.

PERSONAL HYGIENE PRACTICES

Balch and Balch (2000) assert that majority of the food handlers have no previous training in food safety and have poor knowledge of hygiene practice in preparation and distribution of food. Proper food hygiene practice is one of the most important requirements for food handlers in order to prevent food contamination, maintenance of high standard of food safety and personal hygiene with the aim of preventing unpleasant and costly incidents involving food borne illnesses. Therefore, the food served to public should be wholesome and safe for consumption; in order to achieve this, food establishment should ensure proper food hygiene practices and also implement the following practices: Proper personal hygiene by service Staff; Service staff must be medically fit; use of personal protective equipment; good food serving practice.

Proper Personal Hygiene by Service Staff

All persons, including service staff (e.g. waiters, waitresses, cook, cleaners, bakers, store keepers working in a retail or wholesale food establishment should practice good personal hygiene to ensure that food served to customers is safe for consumption. Their food handling and personal hygiene practices may also influence their customer's decisions in re-visiting the food establishment.

Personal hygiene of food handlers refers to the state of cleanness of the food handler and this is a function of the general maintenance of the body. The hair, finger, toe nails, armpits, pubic regions and all other enclosed parts and the entire body and clothes must be scrupulously cleaned and maintained at all times. It also involves proper bathing and wash ups and care of the private and enclosed parts of the earlier mentioned.

Operators of food establishments should ensure that all service staff put on clean clothes and follow good personal hygiene practices to prevent the contamination of food. Some good personal hygiene practices that service staff should adopt include: put on tidy and proper attire when at work. The attire should be changed on a daily basis, or when they are soiled.

They should also keep their fingernails short and clean and not put on nail polish or fake fingernails because Bacteria harbored under fingernails, can get into food when fingernails come into contact with food. Bacteria will multiply and contaminate food.

Also, food handlers should not wear accessories or jewelries when handling food as they may drop into the food. Such articles could also trap food debris that can contaminate food. They should also keep their hair neat and tidy. Long hair should be tied up using hair restraints such as caps while beards must be trimmed and tidy. Effective hand washing is also important to help prevent harmful bacteria from spreading from hands or arms to food, work surfaces, utensils, equipment, etc. Hands and exposed portions of arms must be washed thoroughly with soap and water before starting work and especially after visiting the toilet, having a break, handling money, before and after serving food, coughing, sneezing, eating or drinking, handling rubbish, and cleaning works e.g. clearing plates, wiping tables and cleaning of kitchen. Furthermore, hand sanitizers should be provided within the refreshment area for service staff to disinfect their hands regularly. Soiled hands, however, would need to be cleaned with soap and water before the use of hand sanitizer. In order to prevent the contamination of food or food-contact surfaces, staff should not smoke, spit, pick nose, clean ear with fingers, blow or breathe on glassware or cutlery to polish them or blow air into nylon bag use in putting food. They should also not wipe hands on a dirty cloth, comb or touch hair, or wipe off perspiration with bare hands when handling or serving food.

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, AND MEAT SANITATION', QUESTIONNAIRE.

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.

Data Analysis and Results

Inferential Statistics (Research Questions) and Hypotheses

Research Question 1

1. To what extent do food handlers practice food hygiene in Abia State in compliance with the HACCP-SOPs?

Table 1 Percentage score of respondents

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Aba North	143	37.6183	2.24633	.18785	37.2469	37.9896	26.84	38.60
Aba South	89	37.9792	1.17365	.12441	37.7319	38.2264	27.21	38.60
Osisioma	123	36.8036	3.49790	.31539	36.1792	37.4279	26.84	38.60
Ugwunagbo	113	37.9620	1.08949	.10249	37.7589	38.1651	26.84	38.60
Obingwa	82	37.0023	3.29562	.36394	36.2782	37.7265	26.84	38.60
Total	550	37.4733	2.51381	.10719	37.2627	37.6838	26.84	38.60

Table 1 showed that the mean score is higher in Aba South having 37.9792 followed by Ugwunagbo 37.9620, Aba North 37.6183, Obingwa 37.0023 and Osisioma 36.8036.

ANOVA

Table 2: Percentage score of respondents

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		126.129	4	31.532	5.140	.000
	Linear Term	Unweighted	16.111	1	16.111	2.626	.106
		Weighted	10.855	1	10.855	1.770	.184
		Deviation	115.274	3	38.425	6.264	.000
Within Groups			3343.147	545	6.134		
Total			3469.276	549			

Table 2: this is statistically significant. Since $F(4, 549) = 6.264$, $\rho = 0.000$

Research Question 2

What is the level of personal hygiene among food handlers in Abia State in compliance with the HACCP-SOPs?

Descriptive

TABLE 3: Percentage score of respondents

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Fast food	68	36.5322	3.76587	.45668	35.6207	37.4438	26.84	38.60
Food vendor	216	37.7179	1.95928	.13331	37.4551	37.9806	26.84	38.60
Abattiors	62	37.6305	2.38365	.30272	37.0251	38.2358	27.21	38.60
Dry food	204	37.4802	2.50368	.17529	37.1345	37.8258	26.84	38.60
Total	550	37.4733	2.51381	.10719	37.2627	37.6838	26.84	38.60

Table 4 shows the percentage scores of respondents

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		74.683	3	24.894	4.004	.008
	Linear Term	Unweighted	38.524	1	38.524	6.196	.013
		Weighted	8.987	1	8.987	1.445	.230
		Deviation	65.696	2	32.848	5.283	.005
Within Groups			3394.593	546	6.217		
Total			3469.276	549			

This was based on the scores of food handlers by their food service organizations. Table 4 shows that food vendors scored the highest with mean score of 37.72±4.76%, followed by abattoir with 37.63±2.38%, dry food with 37.48±2.50 and fast food with 36.53±3.76%. The differences are statistically significant, $F(3, 549) = 5.283$, $\rho = 0.005$.

ANOVA

Discussion of Findings

Research question 1 which states, "what are the mean scores of food handlers on the HACCP – based SOP check list in Abia State is answered on table 1 to 2 which is the aggregate scores of all respondents answers the question. The mean score for all of them is 37.47 = 2.51%, this score is very low and indicates faulty or inadequate safety measures among food handlers in Abia State. This score shows that there may be the presence of pathogens in the food served in the study LGAs. This finding agrees with ILRI (2011); Iro et al (2015); Okonko etal (2010), Okoli et al (2006), Clarance et al (2008), One way analysis of variance of the scores in different LGAs showed that: Aba South 37.98± 1.17%, Ogwunagbo 37.96± 1.08%, Aba North 37.62± 2.25% Obingwa 37.00± 3.30% and Osisioma 36.80± 3.50%. The differences in the scores by the different LGAs are statistically significant $F(4,549) = 6.264$, $\rho = 0.000$. The significance of the result caused the null hypothesis to be rejected while the alternative one was retained.

Research question 2 which states to what effects do food handlers in Abia State comply with HACCP SOP check list is answered by table 3 to 4. One way analysis of variance shows that food vendors scored 37.72 ± 4.76%, followed by abattoir with 37.63± 2.38%, Dry food with 37.48± 2.50% and fast food 36.53 ± 3.76%. These differences are statistically significant $F(3,549) = 5.283$, $\rho = 0.005$±. We therefore reject the Ho: which states that, there is statistically different in the mean score of food handlers in Abia State on the HACCP, SOP check list in the study LGAs based on their food establishment.

CONCLUSIONS:

It is concluded that HACCP-SOP check list is not used in Abia State by food handlers. This is confirmed that the result starting from Abia South which had $17.14 \times 10^4 \pm 1.67 \times 10^4$ against

the codex Alimentarius commission standard of $1.000x10^4$ or lower. This means that foods are contaminated with mcroorganisms in the study area leading to cases of diarrhea and death of many food consumers.

RECOMMENDATIONS

i. Government should make policies that HACCP and hygiene should form yearly training requirement for license renewal of all food establishments.
ii. Government should train Environmental Health Officers for adequate inspection of food establishment.
iii. The existing laws on Environment should be reviewed by the government as they current ones are obsolete

REFERENCES

Amadi, A. N. (2009). *Modern Environmental Sanitation.* Nationwide printer and Publishing Co.Ltd. Owerri

Balch, P. A. & Balch, J. F. (2000). *Prescription for Nutritional Healing3RD Edition*, Penguin Putnam Inc. New Yolk, U. S. A. Pp. 2.

Clarence, S. Y. (2008). Assessment of bacteriological quality of ready to eat food (Meat pie) in Benin City metropolis, Nigeria. *Afr J Microbial Res*; 3:390-243.

FAO/WHO (2002). *Principles and guidelines for incorporating microbiological risk assessment in the development of food safety standards*, guidelines and related texts. Kiel: FAO/WHO.

ILRI, (2011). *Assessment of risks to human health associated with meat from different value chains in Nigeria.* Using the example of the beef value chain. Nigeria Intergrades Animal and Human Health Management project Draft report. Nairobi, Kenya.

Iro, O. K., Amadi, C.O.A. & Amadi, A.N. (2015): Assessment of the Meat safety management in Abia/Imo State Nigeria, Implications for the sustenance of the enteric diseases: *Abstract for oral presentation at the annual conference on Environmental Health Sciences, University of Ibadan, Nigeria*.

Litchfield, J. H. (2000). *Salmonella food poisoning*, In Safety of food (2nd edition).

Okoli, C. G., Okoli, I.C., Okorondu V. U. & Opara, M. N. (2006). *Environmental and public health issues of animal food products safety situation in Nigeria*. Ecology of Food and Nutrition; 44:359-373.

Okonko, I. O., Ukut, I. O. E., Ikpoh, I. S., Nkang, A. O., Udeze, A. O., Babaola, T. A., Mejeha, O. K. & Fajobi, E. A. (2010). *Assessment of bacteriological quality of fresh meats sold in Calabar metropolis*, Nigeria. EJEAFChe; 9:89-100.

Omotayo, R. K. & Denloye, S. A. (2002). T*he Nigerian experience on food safety regulations FAO/WHO global forum of food safety regulators:* Marakesh Morocco 28-30January, 2002.

Swedberg, R. (1994). *Market as a social structure.* The handbook of economic sociology, Princeton University Press, 255-282.