

# Effect of Food Safety and Hygiene Training Programme on Knowledge and Practices of Food Handlers in Restaurants in Southern-Senatorial District of Cross River State: A Protocol

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## ABSTRACT

**Introduction:** The public health concern over food safety and complications accompanying improper food safety practices continue to persist globally. Approximately 600 million individuals worldwide experience food hygiene-related illness with an additional 420,000 dying from food hygiene-related complications each year. In Nigeria, over 200,000 deaths occur from foodborne illness annually and the problem is further exacerbated by inadequate infrastructure, poor regulations, and limited awareness of food safety and hygiene practices among food handlers and consumers. Thus, this study is designed to determine the effect of food safety and hygiene training programme on the knowledge and practices of food handlers in restaurants and canteens in Southern Senatorial District of Cross River State, Nigeria. The Information-Motivation-Behavioural Skills Model will be used for this study. **Method:** A quasi-experimental design (with pre-and post-test assessment) will be adopted for this study. The study population will consist of all food handlers operating in restaurants and canteens in the study area with at least six months of work experience who give consent to participate. The estimated sample size will be 74 each for the control and intervention groups. **Ethics and dissemination:** Ethical approval will be sought from the Cross River State Ministry of Health Research Ethics Committee. The intervention strategy will be a clustered nutrition education programme with focus on food hygiene and safety practices, directed at food handlers in restaurants and canteens in the intervention group. The proposed instrument for data collection will be questionnaire and observational checklist. The knowledge level and food safety practices of the participants before and after the training will be recorded. The limitation of the study could be the potential for bias in self-reported data from food handlers regarding their knowledge and practices towards food safety.

**Keywords:** knowledge, practices, food handlers, restaurants.

**Strengths and limitations of this study:** This study will find immense significance in that:

1. Assessing the food handlers' adherence to food safety practices following a training intervention can help build consumer trust and confidence in the safety and quality of the food served.
2. Provide insights into compliance levels and inform regulatory interventions to ensure adherence to standards aimed at enhancing food safety knowledge and practices among food handlers.

3. One limitation of the study could be the potential for bias in self-reported data from food handlers regarding their knowledge and practices towards food safety. There may be a tendency for respondents to provide socially desirable answers or to overestimate their level of knowledge and adherence to food safety practices. To address this limitation, the researcher has employed multiple methods of data collection, such as direct observation of food handling practices in addition to self-report surveys. Direct observation would provide objective data on actual behaviours, allowing for a more accurate assessment of food safety practices. Additionally, validated instruments and anonymous surveys to encourage honest responses from participants would be used.

## INTRODUCTION

The epidemic of foodborne diseases poses a primary global health concern, affecting people across high- and low-income countries. The World Health Organization (WHO) estimates that over 200 diseases are linked to food consumption containing microorganisms or chemical substances such as heavy metals particularly in Africa and Southeast Asia [1]. Approximately 600 million individuals globally experience food hygiene-related illnesses after consuming food, and an additional 420,000 die from food hygiene-related complications each year [2, 3]. The actual data could be higher as many cases and small outbreaks remain uninvestigated. In some African countries, studies have shown that the consumption of contaminated street foods has contributed to the burden of foodborne diseases [4, 5] and in in Sub-Saharan Africa diarrhoea and foodborne disease resulting from consumption of contaminated food has been implicated [6]. Even though some countries are already implementing and maintaining Hazard Analysis and Critical Control Point (HACCP)-based hygiene practices in addressing the issue, however such practices are practically missing in many Africa and resource limited settings, where the impact of foodborne diseases are very high. The current state of food hygiene and safety practices in Nigeria is a significant concern due to the high burden of foodborne illnesses that contribute to morbidity and mortality in the population [7, 8]

In Nigeria, over 200,000 people die from foodborne illness annually. The economic burden associated with foodborne illnesses is around US\$ 3.6 billion per annum [9]. Therefore, meeting food regulatory bodies standard of operation as well the WHO's five key requirements (ensuring cleanliness, separating raw and cooked food, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials) for achieving safer food seems to be problematic in Nigeria where basic amenities, particularly running water and robust sanitary units, are lacking. By the same token, other issues have contributed to poor food safety practices in Cross River State including the rising population, the disparity in incomes, the extended food supply chains, the constantly evolving demographics, the food consumption patterns, lack of food safety regulation, and other factors that are endemic in places with low levels of economic development [10-12]. Although several studies have been carried out in Cross River State, however evidence from such studies shows research gaps. Most of these studies adopted cross sectional descriptive study designs, utilizing self-reported questionnaires which may have influence socially desirables responses on food safety and hygiene practices without utilizing independent observational checklist nor the use of mystery client strategy to observed food handlers' practices. Therefore, this study has been able to fill the identified gaps in knowledge by utilizing a quasi-experimental study design with pre and post designs, following a nutrition training program intervention, utilizing standardized instruments for data collection and observational tools as well as applying the mystery client's strategy to evaluate the food handlers' practices, hence the rationale for this study.

## METHODS AND ANALYSIS

### Study Area

Cross River state is a costal state located in the Niger Delta region of Nigeria and derived its name from the Cross River (Oyono) which passes through the state. The state has three senatorial districts (Southern, Central and Northern) divided into 18 Local government areas with its headquarters in Calabar, bordering Benue State to the North, Ebonyi and Abia State to the West, to the East by Cameroon Republic and to the South by Akwa Ibom and the Atlantic Ocean (Andem *et al.*, 2013). The major languages of the state are Bekwarra, Ejagham and Efik. The state occupies 20,156 square kilometers and comprises and lies between latitude 40281 and 60

551 of the equator and longitude 80 001 and 90 001 East of Greenwich Meridian and is about 105 feet (32m) above sea level. According to the National Population Commission in its 2018 projection estimates the current population of Calabar at about 449,880 using a growth rate of 2.8 percent (NPC, 2018). Cross River is well-known across Nigeria for its exciting tourism, hospitality and rich culinary culture and also a salivating variety of standard dishes which will whet any appetite.

The Southern senatorial district is one of the three districts in the state. The area of the study is comprised of seven local government areas viz: Akamkpa, Akpabuyo, Bakassi, Biase, Calabar Municipality, Calabar South and Odukpani local government area, with boundaries to the central senatorial district, Cameroon, Akwa Ibom and Ebonyi States, and the Ocean. The district epitomizes linguistic and cultural plurality and it boasts of being the venue of the largest carnival in Africa. Their meals are often described as irresistible and of outstanding quality. For instance, 'edikang ikong' or vegetable soup is an original dish of the Efik people and is both nourishing and nutritious. It goes well with so many popular dishes including garri, semovita, fufu and pounded yam. Others include abak soup, ekon soup, afang soup, okro soup, white soup, editan soup, fish soup, and ekpan kwukwo.

### Study Design

A quasi-experimental design (with pre-and post-test design) will be adopted for this study. Quasi experimental design is an empirical interventional study used to estimate the causal impact of an intervention on target population without random assignment.

### Study Population

The study population will consist of all food handlers operating restaurants and canteens with at least six months of work experience.

### Sample Size Determination

The formula for comparing two proportions was used to determine the minimum sample size required [13].

$$N = \frac{2(Z_{\alpha} + Z_{\beta})^2 \times [P_1(1 - P_1) + P_2(1 - P_2)]^2}{(P_1 - P_2)^2}$$

where:

n = minimum sample size in each group.

$Z_{\alpha}$  = 1.96, the critical ratio or standard normal deviate at significance level of 5%.

$Z_{\beta}$  = 0.84, the critical ratio or standard normal deviate at desired power of 80%.

$P_1$  = anticipated change in study group, i.e. the proportion of respondents with good knowledge of food hygiene and safety after intervention; taken as 67.6% [14]

$P_2$  = control group response, i.e. the proportion of respondents with good knowledge of food hygiene and safety before intervention; taken as 51.6% [15]

Inserting the required information in the formula:

$$\frac{2[1.96 + 0.84]^2 \times [0.676 \times (1 - 0.676) + 0.516 \times (1 - 0.516)]^2}{[0.676 - 0.516]^2} = \underline{\underline{174}}$$

**Adjustment for drop-out (loss to follow-up):** To compensate for loss to follow-up, an adjustment was made to the calculated sample size. For instance, with anticipated attrition rate of 5% i.e. response rate of 95%, the sample size selected will be calculated by dividing the original calculated sample size by the anticipated response rate as follows:

1-0.95 i.e.  $174/0.95 = 183$ . The final sample size will be divided by two  $183/2 = 91.5$ . Therefore, 92 food handlers will be selected for each group.

**Inclusion criteria:** The criteria for inclusion will consist of the following:

1. All food handlers (cooks and servers) operating in restaurants and canteens with at least six months of work experience in the study area
2. Those who will give their informed consent to participate in the study
3. Willingness to stay in the study area for the entire duration of the study

**Exclusion criteria:** This study will exclude the following:

1. Food handlers (cooks and servers) operating outside restaurants and canteens and who may not give consent for the study.
2. Food handlers with less than six months work experience in the study area
3. And those who intend to leave the study area within the training intervention period.
4. Food handlers who may not give consent and willingness to participate in the study

**Sampling procedure:** A multistage sampling technique will be employed in the selection of participants.

Stage 1: Selection of Local Government Areas: Simple random sampling technique will be used to select two (2) LGA's out of the seven LGA's in the Southern Senatorial District of Cross River State

Stage 2: Selection of wards: Simple random sampling technique will be used to select six (6) wards (three each) from the two selected Local Government Areas, given a total of 12 wards.

Stage 3: Selection of streets: In each of the selected wards, purposive sampling will be employed to select three (3) major streets, given a total of thirty six (36) streets from the two LGA's.

Stage 4: Selection of restaurants and canteens: Purposive sampling will be used to select four (4) restaurants and canteens ( $183/36 = 5$ ) from each selected street.

Stage 5: Selection of food handlers: In each of the selected restaurants and canteens, one (1) respondent who will meet the inclusion criteria will be recruited using a simple balloting system. We will continue the process until we get the desired sample size for both intervention control group. A total of ninety-two (92) restaurants and canteens will be selected in the intervention and control group respectively.

Stage 6: Selection of intervention and control group: A simple random sampling technique with balloting system will be used to select one Local Government Area out of the two to serve as intervention group while the remainder will serve as control group.

**Intervention:** The proposed intervention shall aim at imparting the recruited food handlers with action-oriented knowledge, skills and behaviours that motivates their ability to adopt optimal food hygiene and safety practices. The intervention strategy will be a nutrition education programme with a focus on food hygiene and safety practices, directed at food handlers in restaurants and canteens in the intervention group. The intervention will be implemented on the Information, Motivation and behavioural Skill Model (IMB) to improve the knowledge, and practices on food hygiene and safety practices among food handlers and by

extension food safety of consumers. The model holds that knowledge gain through food hygiene and safety training will help the food handlers adopt to the necessary changes regarding their knowledge and practices of food hygiene and safety, thus suggesting that food hygiene and safety training remains a key intervention strategy for the prevention of food borne diseases.

The food hygiene and safety training session will be conducted in pidgin/local language by Environmental Health Officers (EHO) who will serve as research assistants on a fortnightly basis for a period of three (3) months. The food hygiene and safety training session will be conducted for at least three (3) times (3 sessions), with each session lasting about two (2) hours. The entire three (3) sessions will be repeated all over again, making a total of six (6) sessions within the three months period. The content of the training will include meaning of food hygiene and safety, place of food preparation, handling, and storing before selling, transportation, handling, and storage of the prepared food, identify overall cleaning and equipment handling, sanitizing after vending food, waste disposal, food handling and hygienic practices. A standardized WHO recommended food hygiene and safety training guide will be adopted for the intervention phase of this study.

The proposed methodology for the training session will be a face-to-face cluster education and discussion sessions with practical demonstration on food hygiene and safety practices. For each new day interacting with the food handlers, a rapporteur for previous day session will be carried out to get feedback from food handlers, laying emphasis on some key areas before introducing a new topic. This will help to reinforce their knowledge, improve their attitude and practices. Even though the proposed training sessions will be facilitator-participants oriented, it will be interactive in nature, and opportunities will be given to food handlers to have hands-on (food hygiene and safety practices demonstration) in other to strengthen their practices.

**Food and hygiene education guide:** The food and hygiene education guide will be adapted from the WHO five keys to safer food, a tool for food safety health promotion. The content include: food safety and food hygiene, WHO five principles of food safety, Importance of food safety to the health of the consumers, sanitary requirement of food processing premises, hygiene and health requirement of food handlers, food spoilage and preservation techniques, food poisoning and food infections, their prevention and control. The content spread across six sessions with opportunity for food demonstration and some practicum on hand hygiene by the Environmental Health Officers (EHO) and return demonstration by the food handlers under the researcher's supervision.

**Instruments for data collection:** The proposed instrument that will be used for this study was developed from sections of three validated instruments adopted from WHO on food handlers' food safety knowledge and hygienic practices.

**Validity of the instruments:** A semi-structured interviewer-administered pre-tested questionnaire adopted from WHO will be used to collect data from selected food handlers on Food safety and hygiene practices [16]. Data will be collected on the sociodemographic characteristics of respondents, knowledge about food contamination, diseases transmitted by foods and good handling practices, personal health and hygiene, contamination/cross-contamination, temperature control, evaluation of self-related practices of food handlers, observational assessment on food handlers towards food safety. The judgement of two nutrition experts, one from the Department of Public Health, University of Calabar and the second from the Cross River State Primary Healthcare Development Agency Nutrition Unit, will be useful for the validation of the questionnaire. The expert will confirm if the questionnaire measured what it was meant to measure (validity) by establishing a logical link between the questions in the questionnaire and the objectives of the study. This will be easily achieved because of their expertise and long-term experience.

**Reliability of the instrument:** The researcher will ensure that all the questions will be clear and the statements unambiguous for the respondents to understand and respond to them, the same way at all times. The test re-test method (with two weeks interval between the two tests) will be used to ascertain the consistency of the questionnaire to produce the same result. The questionnaire will be administered to respondents that will be selected from the study area. "Pearson Product Moment Correlation Coefficient" will be used to correlate the scores while the "Spearman, Brown prophecy formula" will served to correct the result. The result will yield a reliability coefficient which will be considered appropriate for the reliability test of the instrument.

**(A) The questionnaire:** The study instruments will be an interviewer-administered questionnaire and consisting of closed-ended questions. The questions will be suitably modified where necessary to fit the sociocultural context of the study area. Android phones using Open Data Kit (ODK) software will be used for data collection in the field by trained data collectors and will consist of:

Section A: The socio-demographic characteristics and work profile. They comprised of independent variables of this study – sex, age, marital status, level of education, job status, duration of service and previous training/course attended.

Section B: Knowledge about Food Contamination, Diseases Transmitted by Foods and Good Handling Practices. They comprised of causes of food-borne diseases/illnesses, sites of food-borne disease germs in humans, sources of germs that cause food-borne diseases and personal hygiene, knowledge of food handling, cleaning and sanitizing work surfaces; hand washing hygiene and aspect on food hygiene (equipment and personal hygiene) and food safety (food poison, food pathogens, risky food, cross contamination).

Section C: Evaluation of Self-Related Practices of Food Handlers will be modified from questions used in previous studies.

**(B) Observational Checklist:** The proposed checklist for appraisal of food premises will be adapted from National Environmental Policy. It will be used to explore the environmental component of food hygiene and safety. Observation will be used to assess: physical infrastructure of restaurants, personal hygiene of the food, availability of water supply, toilet facility, refuse management and dish/hand washing facilities. The checklist will be use to assess the infrastructure and environment of the food handlers in restaurants and canteens premises to answer the question: to what extent would the environment be an enabling or limiting factor to observed effect of the training?

**Data collection procedure:** In other to avoid biases, Environmental Health Officers (EHOs) will NOT be involved in the administration of the questionnaire. Their major responsibility will be to train the food handlers during the 3 months intervention in clusters and follow them up to ensure compliance. The graduates and undergraduates will be responsible for data collection, using the questionnaire both during the pre-intervention and the post-intervention phase of the study. They will use the face-to-face, interviewer administered method to collect data from food handlers who will be selected to be part of the study. The study adopted direct observational of food handling practices using mystery clients in addition to the self-report surveys on food safety practices.

**Data collection Pre-intervention:** The pre-intervention data will be collected from both groups using the study questionnaire with the help of six (6) field research assistants. They will be train for two days to enhance effective collection of data. The first day will be used to read and familiarize themselves with the instrument and the second day will be used to discuss the different items, respond to all their questions and discuss method of instrumentation. A letter of identification, which will include relevant information about their pledge to maintain confidentiality will be given to each of the research assistants, to avoid bias. The pre-intervention data will be collected just before the commencement of the food hygiene training for the intervention group.

For the control group, no training will be carried out after the collection of the first data. An identification card will be given to any respondent that completed the questionnaire. This allowed for easy identification of respondents and the pairing of data at post-intervention phase. Phone numbers of each respondent will also be collected for tracking purposes during the intervention period. For food handlers without phones, the phone numbers of restaurant owners will be used instead.

**Data collection post-intervention:** The post-intervention survey will be conducted in the intervention group three months after the initial data collection, and the control group's end-of-study data will also be obtained three months after the initial data collection. The same instrument and research team will be used for the post-intervention survey. Immediately after the post-intervention data collection, the control group will also be given the same food hygiene and safety training in the manner described above for the intervention group in

order for them to also benefit from and acquire the training necessary for proper food handling in the interest of the public.

**Study variables:** The independent variables are food safety and hygiene training on food handlers and the socio-demographic and economic factors. The dependent variables are knowledge and practices.

**Method of data analysis:** The raw data will be entered and cleaned in Microsoft Excel 19. A robust method, such as multiple imputation, will be deployed to handle missing data and ensure the reliability of results. After cleaning, data will be transferred into Statistical Product for Service Solutions (SPSS) version 26, where data analysis will be conducted. Descriptive statistics (frequency, mean, standard deviation and percentage) will be used to describe socioeconomic and socio-demographic characteristics, food handler's knowledge and practices on food hygiene and safety. Chi-square test ( $\chi^2$ ) will be used to compare the association between knowledge and practices with categorical socio-demographic and socioeconomic characteristics. T-Test statistics will be used to compare the mean values of the independent variable such as age. A P-value of  $< 0.05$  will be considered statistically significant. In addition, Chi-square test and Fisher's exact tests will be used in determining if any significant differences exist in sociodemographic characteristics between the intervention and control groups. McNemar's test will be used to compare the proportion of respondents' responses at baseline and post-intervention. McNemar's marginal homogeneity test will be used to assess differences in the proportion of respondents with overall good, fair or poor knowledge, at baseline and post-intervention.

**Ethics and dissemination:** Ethical approval has been obtained from the Cross River State Ministry of Health Research Ethics Committee, Calabar with registration number CRS/MH/HREC/2024/VOL.2/030 (see appendix 1). Verbal informed consent will be sought from respondents after presenting them with the study objectives before administering the questionnaire. All respondents will be informed that the information collected will be treated confidentially and that participation in the study is voluntary. Data obtained will be coded, safely secured and destroyed after 3 years of the study. At the completion of this research work, the research findings will be communicated to relevant stakeholders including study participants, the Cross River State government and non-governmental organization implementing food safety and hygiene related intervention in the state. Also, as part of contribution to the body of knowledge, survey findings will be published in high impact journal.

**Authors' contributions:** Peter Bassey Enyievi conceived the research concept and idea, designed the study, reviewed literatures and contributed in writing the final protocol draft. Regina Idu Ejemot-Nwadiaro contributed in reviewing the intervention framework and instruments for data collection. Bernadine Nsa Ekpenyong contributed in enhancing the protocol's methodology. S.A. Inah reviewed literatures and contributed in drafting the protocol's observational checklist.

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**Competing interest's statement:** The authors have declared that no competing interest exists.

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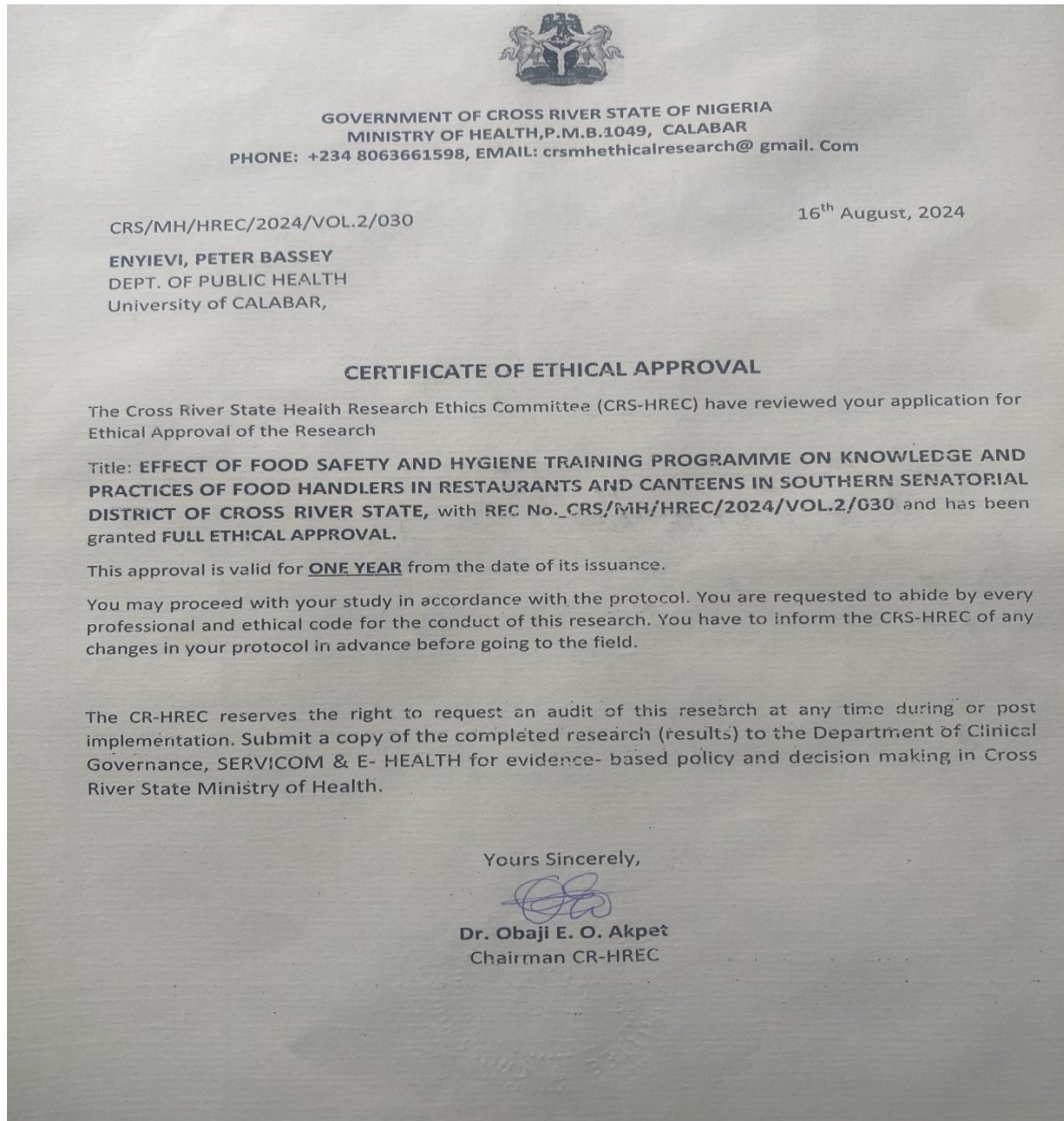
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## APPENDIX 1

### Ethical certificate



## Appendix 1

### Questionnaire

Dear Sir/Madam,

I am **Enyievi, Peter Bassey** a student of Public Health, University of Calabar. I am carrying out research on Effect of food safety and hygiene training programme on knowledge and practices of food handlers in restaurants and canteens in Southern Senatorial District of Cross River State. This questionnaire is designed solely for academic research purpose. Kindly feel free to respond to the questions below as your responses will be treated confidentially.

**Enyievi, Peter Bassey**

(08060868949)

**Instruction:** Kindly place a tick  in the box where necessary. Thank you

<b>Section A: Sociodemographic characteristics of food handlers</b>
Sex: (a) Female [ <input type="checkbox"/> ] (b) Male [ <input type="checkbox"/> ]
Age: (In-years) .....
Level of education: (a) Primary [ <input type="checkbox"/> ] (b) Secondary [ <input type="checkbox"/> ] (c) Tertiary [ <input type="checkbox"/> ] (d) No formal education [ <input type="checkbox"/> ]
Experience as food handler: (a) < 3 years [ <input type="checkbox"/> ] (b) 3 - 5 years [ <input type="checkbox"/> ] (c) > 5 years [ <input type="checkbox"/> ]
Participated in training since started this job: (a) Yes [ <input type="checkbox"/> ] (b) No [ <input type="checkbox"/> ]
Time of the previous training attended: (a) Last 3 months [ <input type="checkbox"/> ] (b) Last 6 months [ <input type="checkbox"/> ] (c) 1 year or more [ <input type="checkbox"/> ]
In what type of food handling facility are you currently employed: (a) Restaurant [ <input type="checkbox"/> ] (b) Canteen [ <input type="checkbox"/> ]
Location of restaurant/canteen:.....

<b>Section B: knowledge on food safety and hygiene practices</b>	<b>Yes</b>	<b>No</b>
<b>(i) Knowledge on hygiene practices</b>		
1. Hand washing with neutral detergent under running water before starting food processing is a necessity for food safety		
2. Repeated use of the same hand towel to clean hands can cause food contamination		
3. It is unhygienic for food handlers to keep uncut nails		
4. Working with rings, necklaces and watches during food processing is allowed		
5. To wash my hands, I should use any soap and clean running water and wash for at least 5 seconds		
6. Personal protective equipment to be used by food handlers include: apron, hairnet and clean closed shoes		
7. Chewing gums and licking sweets during food processing is not allowed		
8. Food processing environment must be free from rodents and other pest		
9. Rubbish bins must not have cover, and can be emptied weekly		
10. The same chopping board can be used for both raw and cooked food		
11. Surfaces in the food processing room should be cleaned with only dry towel regularly		
12. You can prepare food with a wound on the hand if the wound is covered with a bandage		
13. It is not necessary to wash hands to handle food that is already cooked		
14. After using the toilet, we should always wash hands with soap and water		

15. When wearing gloves, you can handle cooked foods after handling raw meat		
16. Hands should be properly washed after sneezing or blowing your nose		
17. When you leave the kitchen and go outside, you should change the footwear		
18. After using the bathroom, hands can be washed in the kitchen sink		
19. Wearing gloves while handling food protects the food service staff from infection		
<b>(ii) Knowledge about food contamination/health risk</b>		
20. A food handler with diseases, such as diarrhoea, influenza and sore throat can also be a part of those cooking, he/she should only wear mask		
21. The use of adornments, such as earrings, rings, and watches, while preparing food, does no harm to the food.		
22. Water can be a vehicle for disease transmission, but once it becomes ice, the risk of disease transmission is reduced.		
23. It is safe to store raw foods (meat) and cooked left-over foods in the same part of the refrigerator.		
24. The cleanliness of food and vegetables does not affect the occurrence of foodborne diseases		
25. Foods unfit for consumption always have a bad smell and taste spoiled.		
26. Using food one day after the expiration date, even when there is no change in smell and/or flavour, is a health risk.		
27. Washing vegetables in running water and soaking them in water with vinegar is sufficient for making this food safe for consumption.		
28. Defrosting can be performed in a basin with or without water in the sink or on a table or countertop that is not refrigerated (room temperature).		
29. Consumption of undercooked food can lead to diseases that cause vomiting and diarrhoea.		
30. You can tell if a food is dangerous to eat by its look, smell or taste		
31. Foods served cold (salads) do not have to be disinfected		
32. Healthy people can cause illness by carrying germs to food		
33. The HIV virus can be spread through food		
34. Cholera can be spread through food		
35. Cooking process does not destroy micro-organisms		
36. Maintaining the cleanliness of the environment where food is managed (such as refrigerators, hand washing stations, floors, etc.) can reduce the risk of food poisoning to consumers.		
37. Food storage in an open place can cause health hazards to buyers/consumers.		

38. Using clean clothes while doing food processing activities cannot reduce the risk of contamination of food		
<b>(iii) Knowledge about food temperature</b>		
39. Foods that need to be kept hot should be at 60°C or above		
40. Leftovers should be reheated to a minimum temperature of 75°C		
41. Microbes may grow because prepared food was left at room temperature for a long period		
42. Cooked foods might be safely stored in the refrigerator at 5°C		
43. Foods should be slowly cooled at room temperature before storage in the refrigerator		
44. Refrigeration kills all the bacteria that might cause food-borne illnesses		
45. Microbes responsible for food-borne illnesses grow well at room temperature		
46. Frozen foods should be thawed on the counter or in the sink		
47. After thawing, meat might be held for 5 hours at room temperature		
48. Foods stored at 40°C is being held in the temperature danger zone		
<b>(iv) Knowledge of food safety and hygiene practices</b>		
49. Hand washing before starting food processing activities is a good practice		
50. Food handler carryout food processing activities while suffering from infectious diseases such as skin diseases, boils, open wounds, and upper respiratory tract infections (URTI)		
51. A Food handler clean off sweat during the food production process or when serving food.		
52. A Food handler washes his/her hands before work or after using the toilet.		
53. The food handler chews gum during the food production or presentation processes.		
54. The handler uses a mask covering the mouth and nose during the food production process or when serving food.		
55. The food handler wears a closed footwear.		
56. The food handler wears clean clothes.		
57. The food handler does not wear jewelry, such as rings, earrings, or necklaces during food processing		
58. The food handler's fingernails are not long.		
59. The food handler coughs or sneezes into the open space when performing food processing activities, not facing the food.		
60. Cleaning of sweat and picking of nose can be irresistible, so the food handler can only do these at least once during the food processing activities.		

<b>Section C: Self-Related Practices of food handlers</b>	<b>Strongly disagree</b>	<b>Dis-agree</b>	<b>Agree</b>	<b>Strongly agree</b>	<b>Not sure</b>
61. I wash my hands before touching unwrapped raw food					
62. I wash my hands before touching cooked foods					
63. I sometimes use my apron/coat and safety outside the food processing area to take urgent calls					
64. I use separate utensils when preparing raw and cooked foods					
65. Since jewelry (necklace, earrings, ring etc) is not harmful, I use them during food processing					
66. My apron is always clean, so I clean my hand on it and make sure I change it daily					
67. I thaw frozen foods at room temperature					
68. I use a thermometer to check the temperature of food					
69. I do not use gloves when serving unwrapped foods					
70. I wash my hands before using gloves					
71. Hands are clean when gloves are removed, so I don't wash them again					
72. I wear an apron or uniform when serving food					
73. I wear a hat or head covering when serving food					
74. I disinfect cutting boards after each use					
75. I use kitchen towels to dry utensils					
76. I sanitize surfaces in the kitchen after washing them					
77. I use separate shoes with cover in front in the food establishment					
78. I use the kitchen napkins to clean my hands each time I wash and make sure I wash the napkin daily					
79. I keep my nails short because of my duty as a food handler					
80. I do not use nail polish during food processing					
81. I come to work when ill with a fever, upset stomach or diarrhoea, and manage to work as much as possible.					
82. I store raw foods separately from cooked foods					

83. I check the shelf life of the food at the time of receipt					
84. I use cleansing products when washing vegetables and fruits					
85. When expiry date of any food is past, and the food is unaltered in its smell and taste, I use them because they are still safe.					
86. I use the same cutting board and knife to prepare raw foods and cooked foods					
87. I check to be sure food is well cooked before it is served					
88. I store all foods in the refrigerator covered in containers.					
89. I wash my refrigerator at least once a month.					

**Appendix 2**

<b>Observation checklist for food handlers on their food safety and hygiene practices</b>	<b>Yes</b>	<b>No</b>
1. Food handlers wore outer aprons or gowns during the visit		
2. Food handlers' aprons or gowns were clean during the visit		
3. Food handlers covered their hair while working		
4. Food handlers' fingernails were trimmed short and clean		
5. Food handlers wear any type of jewelry/ring on their hands at the time of the visit		
6. Establishment and food handlers inspected by regulatory personnel in the past six months		
7. Surroundings well kept		
8. Doors- Evidence of screening with suitable netting to exclude flies and insects		
9. Windows – Evidence of screening with suitable netting		
10. Floors – Floors made of durable non-slippery material and impervious to water.		
11. There should be no breaks on the floor and should be easily cleaned		
12. Walls – All wall surfaces were finished with a smooth impervious substance that will be easily cleaned		
13. Ceiling – Properly ceiled without cracks		
14. Lighting – Adequacy of lighting		
15. Ventilation – Adequacy of ventilation		
16. Availability of adequate potable water supply		

17. Toilet for staff & customers. They should not open directly into food preparation rooms		
18. Hand washing facilities for food handlers/customers to wash their hands after returning from toilet		
19. Paper towels, continuous roller towels or hot air hand dryers available for drying the hands.		
20. Adequate numbers of sinks/wash hand basins should be provided in the eating area for use by customers		
21. Waste Disposal. Bins with tight fitting lids, raised above a concrete stone or other hard floor available and sited in a protected area.		
22. Availability of sanitizers		
23. Adequate chopping boards for both raw and cooked foods		
24. Availability of refrigerator		
25. Refrigerator is hygienically kept		
26. Availability of liquid soap in all hand washing points		
27. Wash area for utensils, well kept		
28. All staff, healthy and free from infection/sicknesses		