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Assessment of The Factors Associated with
Food Safety Practices Among Food Handlers in
Abuja Municipal Area Council (AMAC) FCT,
Nigeria

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Food Safety Practices Among Food Handlers in
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Nigeria.

Directed by professor Heejin Kimm

A Master's Thesis

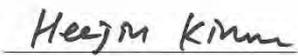
Submitted to the Department of Global Health Policy and
Financing, Division of Global Health Policy and Financing
Capacity Building Program and the Graduate School of Public
Health of Yonsei University

In partial fulfillment of the
Requirement for the degree of
Master of Public Health

Juliet Oluchi Uzoama

December 2021.

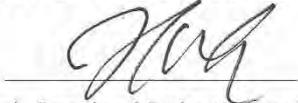
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ACKNOWLEDGEMENT

To God Almighty, I offer my special thanks for his immeasurable mercies and love in my life, especially in the course of this program. His grace and mercies really went a long way to ensuring I completed this thesis successfully.

My special appreciation goes to the chairman, thesis committee member; professor Heejin Kimm and thesis committee members; professor Hee Cheol Kang and Professor Jaehoon Roh for their tremendous and tireless support.

My special thanks goes to the Head of Department, Global Health Policy and Finance, professor Whiejong M. Han, who taught me research methodology, and also, whose advice and encouragement pushed me to follow the thesis without delay.

My unalloyed thanks extend to the Dean, Graduate School of Public Health, professor Jonguk Won, all the lecturers, the teacher assistant, program coordinator and all staff of the entire department for making this work a success.

My sincere gratitude goes to my husband, Ifeanyi Obiora, my family and friends for their unconditional love, support and encouragement.

Indeed, words alone can't express my deep sense of gratitude to those herein mentioned and those not mentioned that contributed in one way or the other to the successful completion of my thesis.

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LIST OF SYMBOLS, AND ABBREVIATIONS

AMAC: Abuja Municipal Area Council

CI: Confidence Interval

FAO: Food and Agriculture Organization

FBD: Food borne diseases

FCT: Federal Capital Territory

FCTA: Federal Capital Territory Administration

FDA: Food and Drug Act

FHT: Food Handler's Test

FSEs: Food Service Establishments

LGA: Local Government Area

MCF: Medical Certificate of Fitness

NABDA: National Biotechnology Development Agency

NAFDAC: National Agency for Food Drug Administration and Control

NIFST: Nigerian Institute of Food Science and Technology

NPFS: National Policy on Food Safety

PHD: Public Health Department

SON: Standard Organization of Nigeria

SPSS: Statistical Package for the Social Sciences

WHO: World Health Organization

Abstract

Background: Foodborne diseases (FBD) are common public health problems experienced in daily life and food safety practices are critical key public health issues to be considered in preventing and controlling foodborne disease spread. However, evidence regarding food safety knowledge and practice is limited in the Federal Capital Territory of Nigeria, and lack of knowledge and poor food safety practices significantly undermines the wholesomeness of food produced by the food handler. Therefore, this study aimed to evaluate factors associated with food safety practice among food handlers in Abuja Municipal Area (AMAC) of the Federal Capital Territory, Nigeria.

Methods: The study was a Cross-Sectional descriptive design that used a multistage sampling technique to select 288 food handlers from three wards. Data were collected using a pre-tested questionnaire and descriptive analyses was done with frequencies and summaries. Chi Square statistics was used to identify the factors significantly associated with knowledge and practice of the food handlers, while p value was set at 0.05 significant level.

Results: While majority of the food handlers had good level of knowledge 77.8% and practice 92.1%, 62.5% had not done their medical check-up, thereby increasing the risk of foodborne disease spread. It was revealed that location of the FSEs ($p = 0.005$) and work experience ($p = 0.004$) were factors significantly associated with knowledge while age ($p = 0.001$), education status ($p = 0.000$), location of the FSEs ($p = 0.001$), work experience ($p = 0.001$) and food safety training ($p = 0.000$).

Conclusion: The overall knowledge of the food handlers translated to good food safety practices. However, they were shown to have poor knowledge on contamination, hand wash and poor practice on checking the temperature of food. Public health awareness campaign and trainings are important interventions to enhance their level of food safety practice and prevent the spread of foodborne diseases.

Key words: Foodborne disease, food safety practice, food handler.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This presents the context of the study, a description of the problem under study, the objectives set to be met throughout the course of study, and the research questions designed to be followed are all described in this chapter.

1.2. Background of the study

Foodborne diseases (FBD) are common public health problems experienced in daily life. They are infectious and toxic diseases caused by a biological, chemical, or physical agent that uses food as vehicle of transmission (Food and Agriculture Organization (FAO), 2017). Foodborne diseases also result from consuming food and water that has been contaminated with micro-organisms and toxins which eventually leads to severe clinical conditions and death in some cases (Isoni Auad et al., 2019). Some of the major diseases are E.coli, Norovirus, Salmonellosis, Enteric high-fever, Campylobacter, Hepatitis A, Listeria and their symptoms range from mild headaches, muscle aches, cramps, nausea, vomiting, diarrhea (sometimes bloody), yellowing in the whites of the eyes and skin, miscarriage, still-birth, preterm labor, severe illnesses and death (Food and Drug Administration, 2019). In addition, food handlers can transmit foodborne with cuts or sores in their mouths or on their skin (Nyawo, 2019). Although the hazards that cause foodborne diseases can happen in the various stages of food production, from “farm to fork”, immediately food gets to the consumer, it can influence the health of the public and result in serious economic damage (Food and Agriculture Organization (FAO), 2017).

Foodborne diseases (FBD) are part of several outbreaks that worsen the health quality of the world’s population, and poor processing, preparation, storage and other poor food safety practices are linked to the spread of foodborne diseases (Lubis et al., 2019). Approximately, 48 million occurrences of foodborne diseases happen every year in the United States, which has resulted in an estimation of 128,000 hospitalizations and 3,000 deaths. Half of the foodborne disease epidemic accounted in the Centre for Disease Control

and Prevention are linked to eating in restaurants (Gould et al., 2013). It was estimated by the World Health Organization (WHO) that up to 30% of the developed country population might suffer from foodborne diseases (Boughattas et al., 2019). In 2010, the World Health Organization stated that 31 foodborne diseases caused an estimated 600 million disease cases and 420,000 deaths, and the higher risk was found in developing countries (Isoni Auad et al., 2019). Foodborne diseases also occurs more frequently in low-income countries of the developing regions where hygiene, sanitation and safe food handling practices during food preparation have been neglected (Lubis et al., 2019). People of all ages, especially children who are below 5 years of age, are also faced with the burden of foodborne diseases, and they constitute 40% of the world's burden of food borne diseases. It also includes individuals living in low-income territories, and Africa has the highest burden per population (Iwu, 2017). Diarrhea, Cholera, Typhoid Fever, Lassa Fever (Viral Hemorrhagic Fever) were reported in 2012 as foodborne related diseases in Nigeria amongst children less than 5 years (Federal Ministry of Health Nigeria, 2014). It invariably indicates that foodborne diseases threaten the population, while the supply of food healthy and safe for public consumption is necessary to prevent foodborne illness.

Food safety is defined as the circumstances and procedures required while producing, processing, storing, distributing, and preparing food to guarantee wholesome and fit for human consumption (World Health Organization, 2002). The core five food safety practices are often described as washing hands and surfaces, separating raw food from cooked food, cooking food to proper temperatures, refrigerating food promptly, and avoiding consuming food from unsafe sources. If not washed frequently and properly during food handling, hands can transmit pathogens to oneself and others, and evidence also shows that washing one's hands for a full 15 to 30 seconds is effective in removing germs. Thus, handwashing for at least 20 seconds is recommended when preparing food (Ji, 2017). Therefore, food safety practices are critical key public health issues to be considered in preventing and controlling foodborne illnesses because the transmission of these diseases can be exasperated by unsafe food safety practices of the food handler

(Dagne et al., 2019). A food handler is a person whose tasks necessitate handling, storing, preparing, manufacturing, selling, or serving food and cleaning surfaces and places exposed to food (Ncube et al., 2019). As food and water contamination occur at distinct phases of food production, the food handler that ensures food safety throughout the chain (Isoni Auad et al., 2019). In most public establishments, the food handlers are the principal persons to contaminate food by being a biological or physical conveyor of many pathogens, and the amount of contamination can be very much determined by the amount of exposure (Chekol et al., 2019). Research has also proven that the occurrence of food poisoning caused by food handlers amounts to 70 percent of bacterial outbreaks of food poisoning (Nyawo, 2019). Therefore, the role of the food handlers in successfully decreasing the risk of foodborne diseases is of utmost importance as they are directly in contact with the consumers, and they are the least challenging aspect of food safety control measures implementation (Iwu, 2017). Therefore, the lack of food safety control measures is a crucial public health issue in most parts of the world.

In Sub-Saharan Africa, especially Nigeria, despite the government's effort to enhance the safety of food supply, by the National Agency for Food and Drug Administration and Control (NAFDAC), food safety remains a significant problem that has worsened by people's ignorance of food hygiene, the attitude of the government towards food safety control and also inadequate enforcement, legislation, and regulations. In addition, the foodborne disease is widespread due to food safety challenges prevalent in regions where resources were not adequately allotted for food safety control and prompt intervention (Iwu, 2017). Nigeria, which has the largest population in Africa, has been undergoing expeditious population growth since the last two decades, from a total of 95, 269, 988 in 1990 to 195, 875, 237 in 2018, with 51% domiciled in the urban metropolis. It has led to changes related to urbanization with the rapid increase of markets, shops, street vendors, and restaurants to satisfy the food need of the growing population (Grema et al., 2020). In addition, there is a rise in the consumption of food prepared in public places due to population relocation and changes in the consumer's behavior and demand. In the urban areas, eating and drinking in

this food establishment (restaurants, bakeries etc.) has become very common. This Food Service Establishment serves food to the public within a short period which implies the risk of possible contamination (Alemayehu et al., 2021). Unsafe food generates a dangerous cycle of foodborne diseases which seriously hampers public health and socioeconomic growth.

Hazardous practices of the food handler worsens the transmission of foodborne diseases which have been estimated to be the result of contamination by food handlers (Dagne et al., 2019). These unsafe practices include unsafe cooking of food by not heating to the required temperature, improper refrigeration by keeping food in temperatures that favor pathogen growth, poor or inadequate cleaning practices (handwashing, surfaces, vegetables), failure to separate food that is easily cross-contaminated, and eating risky food that may contain harmful pathogen (Ji, 2017). In developing countries like Nigeria, the usual weather temperature is perfect for the growth of microorganisms that cause food poisoning. As a result, food may sometimes look attractive, smell and even taste normal, but still bring about severe illness shortly after ingestion (Ifeadike CO, 2014). Unfortunately, Nigeria has poor data collection on foodborne diseases outbreaks and the lack of adequate surveillance system makes it hard to have a precise depiction of the burden of foodborne disease (Ezirigwe, 2018).

1.3. Problem Statement

The Federal Capital Territory (FCT) is the capital of Nigeria, located at the north central part of Nigeria with a temperature that ranges between 30°C to about 37°C. It is also characterized by high diurnal ranges which sometimes drops off as low as 17°C (Magaji, 2020). It invariably contributes to the proliferation of microorganisms in food if not correctly stored within the right temperatures. Poor food safety practices can significantly undermine the wholesomeness of food produced by a food handler, which invariably increases the transmission of foodborne diseases from the food handler to the consumer. There is a rapid growth in the hospitality industry in Nigeria's Federal Capital Territory, which can translate to a high risk of foodborne disease spreading if good food safety

practices are lacking. In a study conducted in South Africa, it was reported that knowledge regarding food safety and hand hygiene was high among food handlers, and knowledge regarding the temperature of food was high. In the same study, the hand hygiene practice also remained high, but practices regarding the temperature of food were low (Seabela, 2020). In another study conducted in South Africa, the food handlers lacked the knowledge of temperature control and they did not adhere to food temperature control procedures because they were not provided with thermometers (Nyawo, 2019). It was also reported in a study conducted in Brazil that when the knowledge of hand hygiene was high, the reported hand hygiene practices were also high (Isoni Auad et al., 2019). In a study conducted in Nsukka campus Nigeria, food handlers had a high level of food hygiene knowledge and practice (Odo and Onoh, 2018). However, in another study conducted in Imo State Nigeria, the knowledge of food hygiene was high while food hygiene practice was relatively low (Iwu, 2017). In a study conducted in FCT, Nigeria, it was observed that foodborne diseases were prevalent among food handlers, poor health status, poor hygienic practices and a widespread of enteric parasites and bacteria were found in the fecal matter of the food handlers (Ifeadike CO, 2014).

Nevertheless, it is difficult to find research results on food safety knowledge and practice of food handlers and other existing factors associated with their food safety practices in the current study area. Nevertheless, the variations in the findings from earlier studies indicate the pertinent for a study to be conducted on the assessment of food safety practices among food handlers as it will help reducing the dangers of foodborne diseases (Kang, 2018). Because many FSEs in the Federal Capital Territory of Nigeria are domiciled in the Abuja Municipal Area Council (AMAC), assessing and evaluating the factors associated with food safety practices among the food handlers will play a dominant role in ensuring compliance with food safety guidelines in other to halt the spread of foodborne diseases.

1.4. Purpose of the study

This study aims to evaluate factors associated with the food safety practice among food handlers in the research area.

1.5. Specific Objectives

To assess the level of knowledge and food safety practice of the food handlers.

To identify factors associated with knowledge of the food handlers.

To identify factors associated with food safety practices of the food handlers.

To compare the knowledge and practice levels of food handlers in the three wards.

1.6. Research Questions

What is the level of knowledge and practice of the food handlers?

What are the factors associated with knowledge among the food handlers?

What are the factors associated with the food safety practices among the food handlers?

What are the differences in the knowledge and practice of food handlers in the three wards?

1.7. Significance of the study

The study will give baseline data and information to explain the food safety practices of the food handlers.

Identifying the factors associated with food safety practices will provide information for policy implementation and interventions like supervision by the health officers, training of food handlers and medical check-up.

The study will enable health educators and administrators design and adopt appropriate technique in regulating FSEs.

The study results will bring to light areas of policy implementation that might be lacking in some FSEs and inform policy makers on the provision of resources for the regulators to discharge their duties with ease.

The study will further help governmental and non-governmental organizations to know areas of need and give necessary assistance where needed.

The study can act as an essential source of literature for further research on food handlers in the FCT.

1.8. Study Variables

Dependent Variables: Food safety practices

Independent Variables

Socio-economic status (SES): Age, gender, marital status, educational level, years of experience.

Predisposing factors: Knowledge

Enabling factors: food safety training, supervision, medical check-up, soap and water for handwash.

Reinforcing factors: Reward

1.9. Operational definitions of the key terms specific to the study

Food safety: Food safety is defined as the circumstances and procedures that are required while producing, processing, storing, distributing, and preparing food to guarantee wholesome and fit for human consumption (World Health Organization, 2002).

Food safety practices: The five core food safety practices are described as washing hands and surfaces often, separating raw food from cooked food, cooking food to proper temperatures, refrigerating food promptly, and avoiding consuming food from unsafe sources (Ji, 2017).

Foodborne diseases (FBD): are diseases that are infectious and toxic, which can be caused by biological, chemical, or physical agent that uses food as vehicle of transmission to enter the body (Food and Agriculture Organization (FAO), 2017).

Food handler: A food handler is a person whose task necessitates handling, storing, preparing, manufacturing, selling or serving food, cleaning of surfaces and places exposed to food (Ncube et al., 2019).

Food handling: This is an activity done daily, irrespective of the individual's occupation, whether being a chef by profession, domestic staffs, or worker in a food establishment (Food and Agriculture Organization (FAO), 2017).

Safe food handling: Safe food handling is a method used in food preparation, which describes how food must be handled to prevent food from being contaminated through the production process (Nyawo, 2019).

Food chain: The food chain extends from the farm to the final consumer, and it includes processing, manufacturing, transforming, packaging, storing, transporting, distributing, and selling of food products (Food and Agriculture Organization (FAO), 2017).

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

A factor is an element contributing to a particular result or situation; it is one of the things that affect an event, decision, or situation (Collins Dictionary, 2007). It is an aspect of a whole, which translates the relationships between a group of variables (Kline, 1994). In this study, factor is a constituent or element that brings about specific effects or results. For example, such an effect or result could be good or poor food safety practices.

Food safety is the fundamental aspect of this study. It is about ensuring that food is prepared and stored correctly to avoid contamination and assuring that it retains sufficient nutrition to maintain a healthy diet (Nyawo, 2019). Food safety can be achieved by using several resources and tactics to ensure food is safe for ingestion. Therefore, practicing food safety is vital for the preventing food from becoming contaminated and causing foodborne disease. Foodborne disease epidemics are usually caused when food is contaminated, particularly by exposure to an infected food handler within the establishment (Gould et al., 2013). This contamination can happen at any point, from cooking to ingestion, making handwashing an essential factor when eliminating foodborne pathogens since hands are a significant source of the spread of pathogens in the kitchen (Williams, 2019). Pathogens multiply when food has not been preserved at the required temperature, and this temperature abuse during storage, preparation, and improper hygiene, are significant contributors to the proliferation of foodborne illness. Therefore, it is highly recommended to thoroughly cook animal-sourced food, avoid unprocessed milk, keep ready-to eat foods cold, wash hands, vegetables, utensils and cutting boards used for raw food (Atis, 2016). According to the FDA's food code, cold food temperature control is set at a temperature of 5°C (41°F), and this law governs receiving, holding, and storage of potentially hazardous food (Goggins, 2017). Other practices include separating raw foods from other foods, cooking food thoroughly, and avoiding consuming food from unsafe source (Ji, 2017). Food handler's food safety practices will require a great understanding of their behaviors and factors that influence food safety practices (Williams, 2019).

2.2. Assessment of Knowledge and Food Safety Practice

Knowledge is defined as a process of recalling, relating or determining a concept or theoretical occurrence (Seabela, 2020), while practices are the process that food handlers use to display their knowledge through their activities (Iwu, 2017). Thus, knowledge is the essential component that influences food safety practices among food handlers (Alemayehu et al., 2021). Knowledge on proper food safety, such as being knowledgeable about food safety through buying food, storing foods, refreezing, thawing, preparation, and serving a meal, is essential when trying to prevent foodborne illness (Williams, 2019) and absence of knowledge on food safety practices was one of the prime causes of diarrhea and foodborne disease in Ethiopia (Alemayehu et al., 2021). A study conducted in the central part of Ethiopia reported that most of the food handlers were unaware of food-borne disease, its causes, mode of transmission, and reason for food contamination (Alemayehu et al., 2021). It invariably shows the risk of foodborne disease among such food handlers because preparing food is the task of a food handler. In a study conducted in Owerri, Nigeria, the score showed that 81% of the food handlers had a good level of knowledge on food hygiene while 36.5% had good practice of food hygienic (Iwu, 2017). Likewise in another study, knowledge regarding food handling practice was high (79.1%) while the food safety practice was relatively poor. Education level also contributed to this variation because 48.3% of the food handlers attended secondary school and above (Chekol et al., 2019). It shows the role education has in the knowledge of food handlers.

According to a study conducted in Beijing on risk behaviors for domestic foodborne disease among people living with HIV, scientific knowledge about domestic food behaviors was included as one of the critical predictors of risk behaviors for personally acquiring domestic foodborne diseases (Ji, 2017). Despite practices being the process that food handlers use to display their knowledge through their activities (Iwu, 2017), several studies detected that sufficient knowledge of foodborne diseases and food safety do not automatically translate to acceptable food safety practices (Oladoyinbo Catherine Adebukola and Ayodeji, 2015). However, it can help the food handlers manage the occurrences of food poisoning as they

should be directly in contact with the food (Lee et al., 2017). It is anticipated that food handlers should have adequate knowledge and skills for hygienically processing food because those who have a good level of knowledge have better chances of good food safety practice (Azanaw, Gebrehiwot and Dagne, 2019). Poor food safety knowledge and poor food safety practices can often cause issues in the kitchen, making it harder to improve and maintain the safety of the food chain (Williams, 2019). In the kitchen, food gets contaminated primarily because of the food handler's poor knowledge and carelessness while processing food (Chekol et al., 2019). According to the study conducted on food safety knowledge, attitude, self-reported practices, and microbiological hand hygiene, food handlers had sufficient knowledge on food safety, yet acquired knowledge was not translated into practices while processing food (Lee et al., 2017). This indicates the sizeable gap between knowledge and practice, and this inconsistency is common in many developing countries (Dagne et al., 2019). A study on food safety practice and its associated factors revealed an identical gap in knowledge and practice of handwashing among mothers in Debarq Town, Ethiopia (Dagne et al., 2019). Despite the gaps existing in several studies, it is still a known fact that food handlers who possess knowledge of good food safety practices can assist in managing the occurrences of food poisoning as they are exposed to ready-to-eat foods (Lee et al., 2017). Inevitably, evaluating and enhancing food-handlers knowledge and practice of food safety is paramount in ensuring strict compliance to food safety guidelines (Alemayehu et al., 2021), ensuring that food is safe for consumption.

2.3. Factors associated with food safety practice

Poor and defective food safety practices are recognized as the primary source of most foodborne diseases (Ifeadike CO, 2014); more so, food safety knowledge and practice are factors that have an essential role in preventing and controlling food poisoning outbreaks (Dagne et al., 2019). In a study conducted in Nigeria, the levels of knowledge detected in most respondents were not commensurate to the level of practice, and this showed that other factors which are also remarkably associated with food safety practices (Iwu, 2017). Several types of research also revealed that knowledge was not transferred into practice

(Isoni Auad et al., 2019). In a systematic review on factors associated with safe food handling practices in the food service sector, one of the studies revealed that age had a significant effect on the food safety knowledge of the food vendors among different age groups in Malaysia. Gender is a determining factor, and a study revealed that men happened to be less knowledgeable regarding food safety practices than women, and they tend to use riskier cooking practices (Williams, 2019).

Moreover, the traditional role of women in Africa generally involves cleaning and cooking; these skills can also contribute to good food safety practice among women (Grace et al., 2012). In a study conducted on the impact of gender and group membership on food safety, in the case of meat sellers in Bodija market, Ibadan Nigeria, there was no significant difference among men and women with regard to knowledge of food safety. However, women had significantly better food safety practice (Grace et al., 2012). Research shows that older adults and women have better knowledge and behaviors concerning foodborne disease prevention than younger people and men (Ji, 2017). Knowledge and practice are influenced by previous training (Ifeadike CO, 2014), and training has also been linked to an increase in knowledge and improvements in food safety behaviors (Saniga, 2018). Therefore, it is imperative that food safety training be conducted in an accessible and understandable way to all workers to prevent food-borne illnesses (Farah, 2017). Years of working experience has been established as a factor as food handlers who worked for longer years in food restaurants had better food hygiene and safety practices (Ifeadike CO, 2014). Inadequate food safety law, unavailability of food establishment guidelines and principles, and faulty monitoring and evaluation system of food establishments play a significant role in food safety practice (Chekol et al., 2019). Therefore, restaurants need to be thoroughly inspected, alongside improving their sanitary conditions (Onyeneho and Hedberg, 2013). Research show that lower inspection scores happened to be one of the different factors significantly associated with foodborne diseases among food handlers (Biando, 2018). The knowledge of food handlers, supervision by health officers, food safety training, routine medical checkup, and marital status were significantly associated with good food safety

practice in a study conducted in Ethiopia (Azanaw, Gebrehiwot and Dagne, 2019). This study further revealed that single food handlers had lower chances of good food safety practices than food handlers who were divorced. Another study revealed that good attitude, secondary school, higher education levels, and job experience in different food establishments were factors associated with good food safety practices (Chekol et al., 2019). It further mentioned refrigerator in the kitchen and the utilization of the three sectioned dishwashing system as also factors associated with good food safety practices (Chekol et al., 2019). In a study conducted in Ethiopia, routine medical checkup was also a factor significantly associated with good food safety practice. This was attributed to the advice health care workers gave to the food handlers during food handlers examinations (Azanaw, Gebrehiwot and Dagne, 2019). The most commonly reported contamination factors in a study happened to be food preparation by an infectious or infected person. Therefore, food handlers must be mandated not to cook food when sick to avert the chances of spreading pathogens (Gould et al., 2013), must be screened bi-annually and issued medical certificate of fitness (Federal Ministry of Health Nigeria, 2014).

Besides the factors mentioned above, scientific literature suggests that the following factors can also influence food handling behaviors; skills, availability of resources, rewards and social support. Hand hygiene is a basic criterion for ensuring safe food preparation (Lee et al., 2017). Therefore, it is pertinent for food handlers to understand hygiene better to improve their practices (Iwar, 2017). Research showed that only 17% of the food handlers adhered to the correct hand washing procedure (Onyeneho and Hedberg, 2013), which is necessary for preventing contamination. The research further stated that another skill necessary is to avoid cutting raw meat, food, fruits, and vegetables on the same cutting board. Scientific literature has also indicated that not practicing desired behaviors are due to lack of skill and other environmental factors (Janssen et al., 2020). Practicing food safety requires having the knowledge and resources needed to do so (Ji, 2017). Researches have indicated that employees think practicing good food safety will be easier with the availability of resources such as knowledge from training, time and equipment (Biando,

2018), refrigerator, cutting boards (Ji, 2017), and handwashing facilities like warm running water, soap and disposable towels (Miller, 2020). In a study conducted in Ethiopia, the availability of a functioning hand wash station was associated with food safety practices (Okugn and Woldeyohannes, 2018) and lack of handwashing stations, thermometers to check food temperature, pallets to store food off the ground and gloves, were included as barriers to food safety practice in the farmers market, New York (Miller, 2020). Food safety training is a significant factor in food safety practice, and this is because it helps the food handler acquire better knowledge on food safety practices (Alemayehu et al., 2021). In a study conducted in Ethiopia, out of three hundred and eighty-four food handlers, one hundred and seventy food handlers had good knowledge, while one hundred and eighty-eight had good food safety practice, and the odds of good food safety practice were attributed to food handlers with food safety training (Azanaw, Gebrehiwot and Dagne, 2019). Knowledge is insufficient to trigger preventive practices but will also need some mechanism to motivate action and generate positive behaviors (Yenealem, Yallew and Abdulmajid, 2020). Research conducted in New York indicated that having food safety training and additional interventions were more successful than training alone. These interventions include monetary reward, amongst others, and the research further recommended that monetary and social rewards are equally significant predictors of food handler's compliance with food safety regulations (Miller, 2020). Findings also indicate that peer support is vital in generating a productive hand hygiene culture, while suitable reward and acknowledging food handlers skillful in hand hygiene is a strong incentive (Sendall, McCosker and Halton, 2019).

2.4. Regulatory Framework on Food Safety in Nigeria

In Sub-Saharan Africa, especially Nigeria, food safety remains a critical problem that has been exacerbated by the people's poor awareness of food safety, the government's disorganized approach to food safety standards, and the faulty implementation of food safety legislation and regulations (Iwu, 2017). Regulations ensure food safety, the prevention, and control of foodborne disease, making up the critical public health tool. The

practice of food safety determines the compliance of Food Service Establishments (FSEs) to regulations, and the fundamental aspect of public health regulation is to authorize officials to guarantee the delivery of good food safety practices in communities (Iwar, 2017).

Nigeria operates a multiple agency Food Safety Control System. As a result, the implementation of food safety legislations is fragmented among the three levels of government. It includes the federal, state and local government area councils. They are the Federal Ministries of Health, Environment, Agriculture, Science and Technology, Trade and Investment, with their Agencies. They include the National Agency for Food Drug Administration and Control (NAFDAC), Standards Organization of Nigeria (SON), Consumer Protection Council, Nigeria Customs Service, National Biotechnology Development Agency (NABDA), Nigerian Institute of Food Science and Technology (NIFST), National Agricultural Seeds Council, and the National Biosafety Management Agency which all perform regulatory roles on food safety, at the different levels of government.

Several laws have been established to respond to the existing food safety issues, including the NAFDAC Act and the Food and Drugs Act (FDA). However, because food safety regulations are fragmented and have been aggravated by overlap of functions of the regulatory bodies with separate roles through the farm-to-table process, the National Policy on Food Safety was adopted in 2014. The aim was to integrate all extant laws and standards that regulate food safety practices in Nigeria, re-evaluate and harmonize the food control structure at all levels of government, and eliminate overlapping functions and conflict. Implementing the National Policy on Food Safety (NPFS) is expected to reduce the risk of a foodborne disease outbreak from poor food safety practices. The Food Service Establishment (FSE) and food handlers in the Federal Capital Territory (FCTA) of Nigeria are regulated by the mandate of the National Policy on Food Safety (NPFS) under the State Ministry of Health.

The duties entail the following:

- Implement food safety policies, programs, and activities in the States.
- Harmonize and oversee all activities on food safety within the LGA(s) in the State
- Provide technical assistance to the LGA(s) in developing and implementing food safety programs
- Inspect and register all Food Service Establishments within the State
- Liaise between the federal and local government on food safety surveillance, reporting and information system
- Conduct public health surveillance on the FSEs under their jurisdiction
- Explore food safety complaints in FSEs
- Conduct bi-annual medical examination of food handlers and issue medical certificate of fitness accordingly.

However, regulating food safety in Nigeria comes with its issues. The food safety challenges, and foodborne diseases spread in Nigeria has been worsened by people's incomprehension of food safety, government's uncoordinated approach to food control, absence of technical competence, and faulty regulatory enforcement. Others include the poor realization of the socioeconomic importance of food safety due to unavailability of data and statistics on the occurrence of foodborne disease outbreaks. Nevertheless, these challenges can be controlled with an intensive awareness campaign to educate the food handlers and the general public, and the collaboration of all relevant regulatory agencies as expected in the national policy on Food safety.

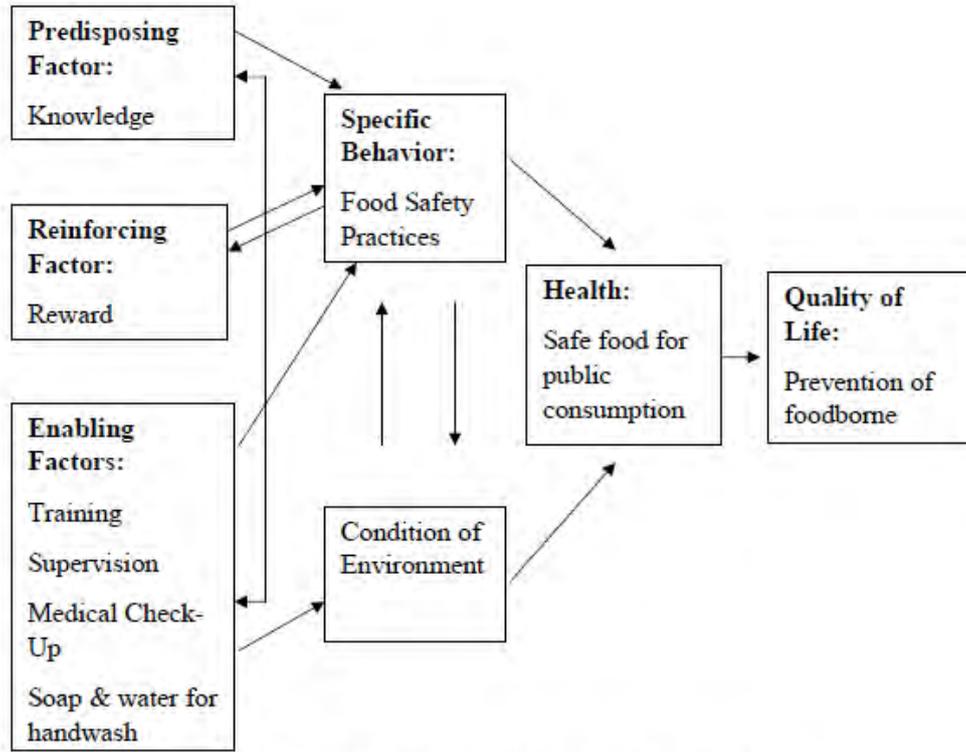
2.5. Conceptual Framework

The PRECEDE-PROCEED Model provided the framework for the study. It is adapted and applied as a conceptual framework for assessing the relevant sociodemographic and behavioral factors associated with food safety practices among food handlers. It proffers implementing intervention programs that will lead to behavioral change and promote good food safety practices among the food handlers, which will eventually lead to the prevention

and control of foodborne diseases in the Federal Capital Territory of Nigeria. The model classifies factors into three groups: predisposing, enabling, and reinforcing factors and all of these factors influence an individual's actions and behaviours.

The PRECEDE PROCEED model seeks to identify these three factors and make behavioral changes with regards to the predisposing factors (knowledge of the food handlers), reinforcing factors (reward and motivation of the food handler), and enabling factors (access to resources, policies, legislation, and extant regulations) that influence the adoption of the health-related behavior through implementation of an intervention program (Pourhaji et al., 2020). The intervention programs will be recommended based on the problem and need assessment of the food handlers.

Figure 1 Conceptual Framework of factors associated with food safety practices among food handlers in Abuja Municipal Area Council.



CHAPTER THREE: RESEARCH MEHODOLOGY

3.1. Study Setting

The Abuja Municipal Area Council (AMAC) is one of the six area councils and the largest under the Federal Capital Territory of Nigeria. According to the National Population Commission and National Bureau of Statistics, the AMAC population was estimated to be 1,967,500 in 2016. The Abuja Municipal Area Council is subdivided into 12 wards but Kabusa, Gwarimpa and Nyanya were selected for the study. The Food Service Establishments (FSEs) are facilities that prepare and serve a large amount of food to many people, including hotels, restaurants, bakeries etc. The food handlers are persons working in these establishments, their job description entails cooking and serving food to the consumers, and they play an essential role in preventing food borne disease spread. Therefore, they are the respondents that were selected for the study.

3.2. Study Design

Cross-sectional study design and quantitative method were used to assess the factors associated with food safety practices among the food handlers alongside a self-administered questionnaire. This design was chosen because it facilitates the description of situations as they exist in their natural setting, assesses the characteristics of the whole population, and gives the exact picture of the study.

3.3. Study Population

The population for the study consisted of all food handlers aged 18 to 65years, working in Food Service Establishments (FSEs) Abuja Municipal Area Council, numbering 934 (Environmental and Occupational Health Division, Public Health Department (PHD), 2021), with a total of 144 facilities (FSEs). The food handlers in each establishment consisted of those cooking, serving, and all persons who encounter the food during preparation, till it gets to the consumer.

3.3.1. Inclusion Criteria

The food handlers working in the Food Service Establishments (FSEs), registered, and regulated by the Environmental Health Officers under the State Ministry of Health, were included in the study.

3.3.2. Exclusion Criteria

The food handlers working in FSEs that were not registered and regulated by the Environmental Health Officers in the State Ministry of Health were excluded from the study.

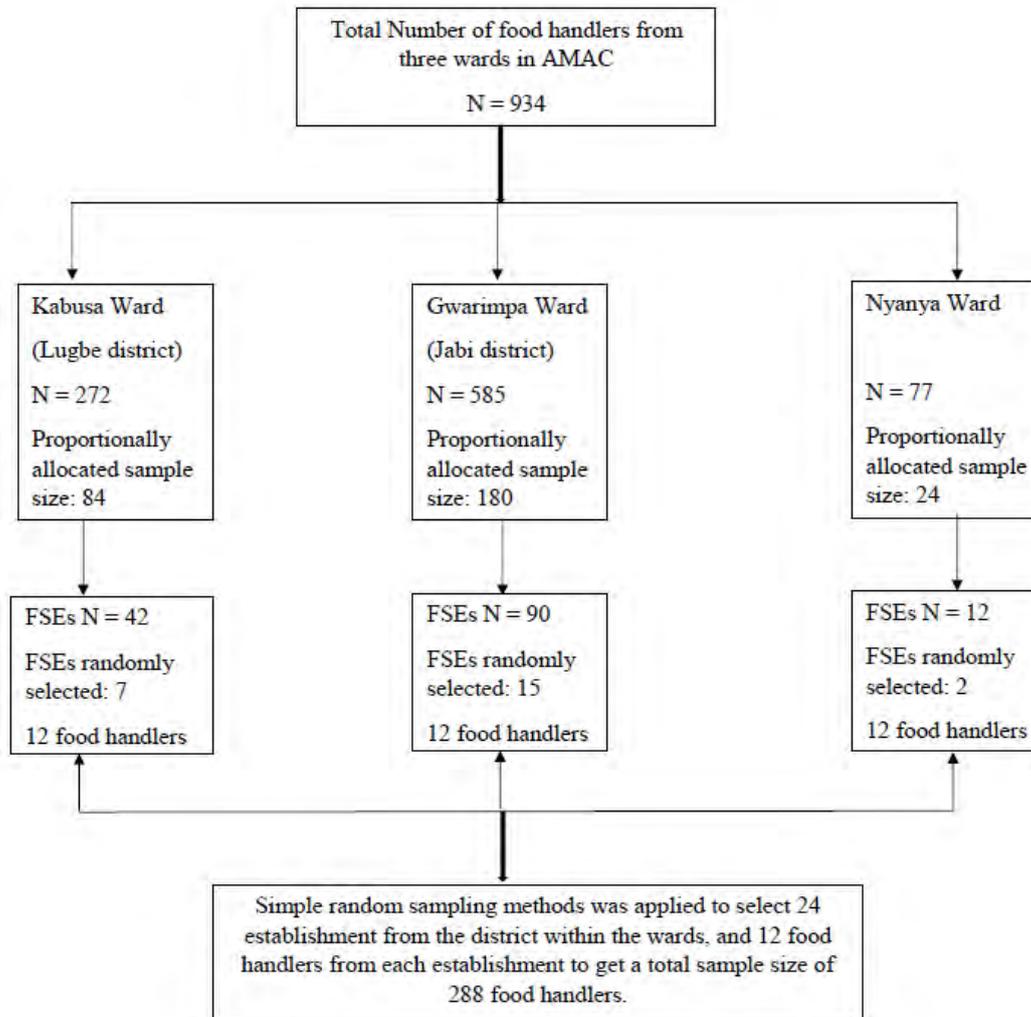
3.4. Sample Size Determination

The sample size for this study was calculated using Cochran's formula given as $n = (z^2pq/e^2)$ where $n =$ was the desired sample size, $z =$ standard normal deviate at 95%, Confidence Interval = 1.96, $e =$ precision level 5% = 0.05 and $p =$ the estimated proportion of food handlers that had a certain knowledge and practice from a study conducted in Nigeria (Iwu, 2017) which was set at 0.5, $q =$ the complementary probability of p which was $1 - p$ (0.5). Therefore, $n = ((1.96)^2 (0.5) (1-0.5)) / (0.05)^2 = 384$ (Cochran's sample size). From the finite source of population of 934 food handlers in Abuja Municipal Area Council (AMAC), the adjusted sample size was $n = (no / 1 + (no - 1) / N)$ which mathematically, $n = (384 / 1 + (384 - 1) / 934)$. Therefore, n for this study was 288 food handlers after considering 5% non-response rate.

3.5. Sampling Strategies/ Method

A multistage sampling technique was employed to draw the sample for the study. It involved three stages. In the first stage, purposive sampling technique was used to select three (3) wards out of the twelve (12) wards in Abuja Municipal Area Council (AMAC), Kabusa, Gwarimpa, and Nyanya. In the 2nd stage, purposive sampling technique was used to select the district with the largest population within each ward. In the 3rd stage, simple random sampling was used to select the Food Service Establishments (FSEs) from each district and food handlers from each establishment.

Figure 2 Sampling Procedure



3.6. Data Collection Procedure

After obtaining ethical permission to conduct data collection from the Secretary, FCT Health Research Ethics Committee, Health and Human Service Secretariat, Federal Capital Territory Administration (FCTA), Nigeria, the questionnaires were administered face to

face, and six personnel were engaged as data collectors including an Environmental Health Officer who acted as supervisor of the team. They were trained via zoom meeting about the research objectives, questionnaire and filling of the tool. The officers were allocated to different wards, and they provided a clear explanation of the purpose of the study to the FSEs and research participants prior to data collection. Data collection took place in November, 2021.

3.7. Data Analysis

The data collected was checked for completeness before being entered and analyzed using the Statistical Package for SPSS version 26 software. Data were analyzed using descriptive statistics (percentages, frequencies and tables) to describe and present the data, the socio-demographic characteristics and compare the knowledge and practice levels among the three wards. Chi Square was used to test the factors associated with knowledge and food safety practices. The statistical significance was determined at 5% significance level ($p=0.05$) with a 95% confidence interval.

3.8. Research tool/ questionnaire and variables measurement

The questionnaire has 4 parts.

Part 1: Consist of 5 items assessing the socio-demographic characteristics of the study participants such as age, gender, marital status, level of education and level of experience. The percentages and frequencies were used to describe socio-demographic factors of the participants.

Part 2: The knowledge questions consisted of 11 items regarding the cause of foodborne diseases, mode of transmission, and contamination. Each item had a response of true, false and do not know. The respondents who selected the wrong response and did not know were categorized as poor level of knowledge, while those who selected the correct response were categorized as having a good level of knowledge.

Part 3: The practice questions consisted of 13 items regarding the food handler's food safety practice. Each item had a Likert scale from 1 to 5, where 1= Never, 2 = Rarely, 3 =

Sometimes, 4 = Most of the times and 5 = Always. The respondents who selected 1, 2, and 3 were categorized as a poor level of food safety practice, while those who selected 4 and 5 were categorized as good level of food safety practice.

Part 4 is the food safety enabling factors section which was further divided into 5 sections.

1. food safety training status of the food handlers, which consisted of 5 items
2. The supervision status of the food handlers, which consisted of 2 items
3. The medical check-up status of the food handlers consisted of 3 items
4. The soap and water for hand wash section, which had 1 item
5. The reward status of the food handlers, which consisted of 3 items.

Each item had a response of yes and no and few items with other responses. Percentages and frequencies were used to describe the food safety enabling factors of the food handlers.

3.9. Validity and Reliability

Validity and reliability of factors associated with food safety practices questionnaire was evaluated by different validity and reliability indexes to complement the overall evaluation. Content validity was be established by coherent analysis.

To measure internal consistency of the research tool, a pre-test was performed on 20 (5%) food handlers out of the study area, according to previous research (Azanaw, Gebrehiwot and Dagne, 2019) before actual data collection. In addition, Cronbach's Alpha was done for the knowledge and practice items of the research tool. The tool was also reviewed by the thesis committee chairman and a Chief Environmental Health Officer in the Public Health Department, FCTA, before being administered in the field.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.732	.654	8

The Cronbach's Alpha score for the knowledge section was higher than 0.7 after removing items 1, 4 and 5. Therefore, the eight remaining questions were deemed to be reliable.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.849	.828	13

The Cronbach's Alpha score for the food safety practice section was higher than 0.8. Therefore, all questions were deemed to be reliable.

3.10. Data Management

All data pertaining to the current study are kept in both hard and soft copies, sources of information was kept by the researcher in the university library, and research findings were shared with the Department of Public Health and Health Research Ethics Committee, Health and Human Service Secretariat, Federal Capital Territory Administration (FCTA), FCT. The research documents are kept confidential following the Yonsei University research ethics.

3.11. Ethical Considerations

Ethical approval for the proposal was obtained from the Secretary, Health Research Ethics Committee, Health and Human Service Secretariat, Federal Capital Territory Administration (FCTA). In addition, permission was obtained from the FSEs, individual rights to respect, confidentiality and privacy were endorsed, and informed consent was obtained from all respondents willing to participate in the study. All information was confidential, participation voluntary, and anonymous during data collection.

3.12. Dissemination of Study Findings

The findings were presented during the defense and submitted as well to Yonsei University. Findings was communicated to the Department of Public Health, Health and Research Ethics Committee, Health and Human Service Secretariat, Federal Capital Territory Administration (FCTA), and other relevant associations for the FSEs in the Abuja Municipal Area Council (AMAC), FCT. In addition, findings were prepared for publication in national and international journals and national programs.

CHAPTER FOUR: PRESENTATION OF THE RESULTS

4.1. Socio-demographic Characteristics of Food Handlers

In this study, a total of 288 food handlers participated, with a response rate of 288 (100%). Out of the total participants, more than half, 171 (59.4%) were females, fell between the age range of 18 to 30 years 166 (57.6%) and were single 157 (54.5%). The majority 202 (70.1%) had tertiary education, more than half 180 (62.5%) worked in Food Service Establishments (FSEs) domiciled in Jabi ward, and less than half 126 (43.8%) of the food handlers fell between the work experience range of 1 to 4 years.

**Table 1 Socio-demographic characteristics of food handlers in Abuja
Municipal Area Council.**

Variable	Category	Frequency (n=288)	Percent (%)
Age	18 to 30 years	166	57.6
	31 to 40 years	102	35.4
	41 to 50 years	16	5.6
	51 years and above	4	1.4
Gender	Male	117	40.6
	Female	171	59.4
Marital status	Single	157	54.5
	Married	131	45.5
Educational status	Not read and write	2	0.7
	Primary	7	2.4
	Secondary	77	26.7
	Tertiary	202	70.1
Location	Jabi	180	62.5
	Lugbe	84	29.2

	Nyanya	24	8.3
Work experience	<1 years	98	34.0
	1-4 years	126	43.8
	>4 years	64	22.2

4.2. Knowledge of Food Handlers

The majority, 266 (92.4%), responded that foods not fit for consumption constantly changes taste, smell and colour. Similarly, most 258 (89.6%) of the food handlers also responded that freezing destroys micro-organisms, resulting in food spoilage and foodborne diseases. In addition, half of the food handlers, 149 (51.7%) responded that wearing gloves is an alternative for hand wash, while 67 (23.3%) responded not to know if gloves were alternative for hand wash. Overall, the majority, 224 (77.8%) of food handlers, had good knowledge, and only 64 (22.2%) had poor knowledge regarding foodborne diseases, mode of transmission, and contamination.

Table 2 Knowledge of food handlers regarding cause of foodborne diseases, mode of transmission and contamination in Abuja Municipal Area Council.

Variables	Number of Responses (n=288) (%)		
	True	False	Don't know
Wearing gloves is an alternative for washing hands	72(25.0)	149(51.7)	67(23.3)
Freezing destroys micro-organisms that may result in food spoilage and foodborne diseases	258(89.6)	22(7.6)	8(2.8)
Eating food one day after its expiry date is dangerous to health	259(89.9)	17(5.9)	12(4.2)

Food that is not fit for consumption always changes taste, smell and colour	266(92.4)	17(5.9)	5(1.7)
Washing fruit and vegetables under running water and peeling is sufficient to make them fit for consumption	274(95.1)	12(4.2)	2(0.7)
Properly prepared food is free from micro-organisms that results in foodborne diseases	263(91.3)	23(8.0)	2(0.7)
Food handlers that are unwell do not need to avoid food preparation	28(9.7)	228(79.2)	32(11.1)
Washing hands with soap and water for at least 30 seconds kills microbes that cause foodborne disease	269 (93.4)	17 (5.9)	2 (0.7)

Total Knowledge	Frequency	Percent (%)
Good	224	77.8
Poor	64	22.2

4.3. Food Safety Practices of Food Handlers

The majority 186 (64.6%) of the food handlers reported consistently washing their hands before and after preparing foods, nearly half 140 (48.6%) wash their hands most of the time after touching money, and the majority 184 (63.9%), consistently wash their hands after using the toilet. Less than half 119 (41.3%) of the food handlers reported consistently using gloves to distribute prepared food, less than half 124 (43.1%) always wear an apron and cap when preparing food, while over half 154 (53.3%) always wear nose mask when preparing food. However, less than half 102 (35.4%) of the food handlers sometimes use separate cutting boards for meat and vegetables, and 118 (41%) always check food temperature after warming. The majority, 206 (71.5%) reported never preparing food when they are unwell, 214 (74.3%) reported never using the food after it has expired, even when

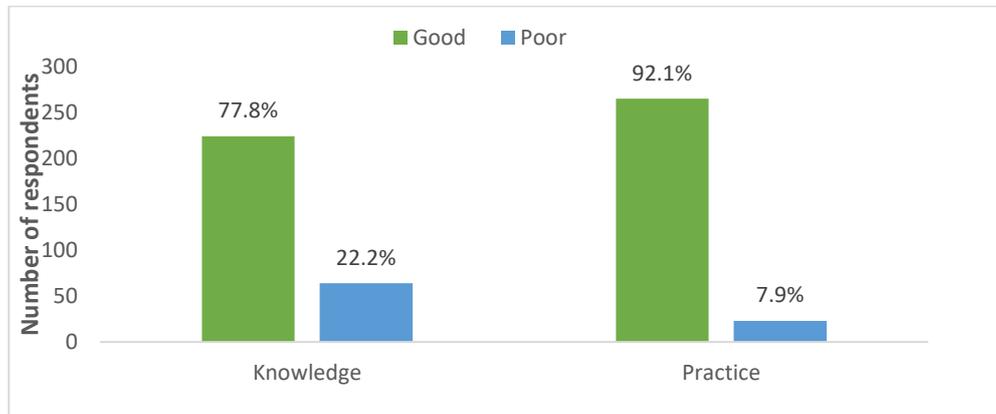
there is no change in colour and taste, while less than half 118 (41%) always clean surfaces and kitchen equipment during food preparation. Over half 181 (62.8%) always clean the kitchen after cooking, and 159 (55.2%) wash hands with soap and running water for over 30 seconds. Overall, the majority, 265 (92.1%) of food handlers, had good food safety practices, and only 23 (7.9%) had poor food safety practices.

Table 3 Food safety self-reported practices assessment of food handlers in Abuja Municipal Area Council.

Variables	Number of Responses (n=288) (%)				
	Never	Rarely	Some times	Most times	Always
Do you wash hands before and after preparing foods?	0 (0.0)	3 (1.0)	23 (8.0)	76 (26.4)	186 (64.6)
Do you wash hands after touching money?	1 (0.3)	0 (0.0)	25 (8.7)	140 (48.6)	122 (42.4)
Do you wash hands after using the toilet?	0 (0.0)	0 (0.0)	31 (10.8)	73 (25.3)	184 (63.9)
Do you use gloves to touch or distribute prepared foods?	13 (4.5)	9 (3.1)	36 (12.5)	111 (38.5)	119 (41.3)
Do you use apron and cap when preparing foods?	22 (7.6)	19 (6.6)	32 (11.1)	91 (31.6)	124 (43.1)
Do you wear nose mask when preparing foods?	23 (8.0)	11 (3.8)	35 (12.2)	65 (22.6)	154 (53.5)
Do you use separate cutting board for fresh vegetables and raw meat?	87 (30.2)	37 (12.8)	102 (35.4)	37 (12.8)	25 (8.7)
Do you check the temperature of food after warming?	44 (15.3)	30 (10.4)	42 (14.6)	54 (18.8)	118 (41.0)

Do you prepare food when you are unwell (e.g., cold, diarrhea, coughing, vomiting, fever)?	206 (71.5)	28 (9.7)	20 (6.9)	19 (6.6)	15 (5.2)
Do you use food after it has expired, when there is no change in colour and taste?	214 (74.3)	22 (7.6)	19 (6.6)	13 (4.5)	20 (6.9)
Do you clean surfaces and kitchen equipment during food preparation?	5 (1.7)	12 (4.2)	22 (7.6)	131 (45.5)	118 (41)
Do you clean the kitchen immediately after cooking?	1 (0.3)	2 (0.7)	15 (5.2)	89 (30.9)	181 (62.8)
Do you wash your hands with soap and running water for at least 30 seconds?	1 (0.3)	2 (0.7)	33 (11.5)	93 (32.3)	159 (55.2)
Total Practice					
Good	265			92.1	
Poor	23			7.9	

Figure 3 Levels of knowledge and food safety practice of food handlers.



4.4. Assessment of the Enabling Factors for Food Safety Practice of Food Handlers

From the total participants, the majority, 230 (79.9%), had received food safety training in the last six months, and among those who had received training, 212 (92.2%) admitted to having received the needed knowledge from the training. The majority, 274 (95.1%) of the food handlers, also recommended the training to be done on regularly, and among those who made the recommendation, more than half 184 (67.2%) opted for quarterly food safety training. The majority, 258 (89.6%) of the food handlers, had been supervised by Environmental Health Officers in the last six months, and 267 (92.7%) were aware that their medical check-up should be done with the Public Health Department every six months. However, more than half 180 (62.5%), had not done the medical check-up, and among those who had not, 139 (77.2%) reported they had a medical check-up one year ago. The majority, 224 (77.8%) had access to a handwash station with soap and running water, and 252 (87.5%) were aware of incentives for practicing food safety according to the guidelines. However, more than half 166 (57.6%) had not received any reward for practicing good food safety.

Table 4 Assessment of the enabling factors for food safety practices among food handlers in Abuja Municipal Area Council.

Variables	Responses	Frequency (n=288)(%)
Food safety training		
Are you aware of food safety training course?	Yes	270 (93.8)
	No	18 (6.3)
Have you received food safety training in the last 6 months?	Yes	230 (79.9)
	No	58 (20.1)
If yes , did the training provide you with the needed knowledge?	Yes	212 (92.2)
	No	18 (7.8)
Will you recommend the training to be done on a regular basis?	Yes	274 (95.1)
	No	14 (4.9)
If yes , what duration(s) would you recommend?	Monthly	52 (18.9)
	Quarterly	184 (67.2)
	Biannually	38 (13.9)
Supervision		
Are you aware that Environmental Health Officers are supposed to supervise your establishment at least once a month?	Yes	262 (91.0)
	No	26 (9.0)
Have you been supervised by Environmental Health Officers in the last 3 months?	Yes	258 (89.6)
	No	30 (10.4)
Medical Check-up		
Are you aware you are supposed to undergo medical check-up, every 6 months with the Public Health Department?	Yes	267 (92.7)
	No	21 (7.3)

Have you had the medical check-up in the past 6 months with the Public Health Department?	Yes	108 (37.5)
	No	180 (62.5)
If no , when last did you do the test?	1 year ago	139 (77.2)
	2 years ago	13 (7.2)
	Cannot remember	17 (9.5)
	Never	11 (6.1)

Hand wash

Do you have a hand wash station with soap and running water?	Yes	224 (77.8)
	No	64 (22.2)

Reward

Are you aware of the guidelines for practicing food safety in your establishment?	Yes	277 (96.2)
	No	11 (3.8)
Are you aware of incentives for practicing food safety by the guidelines?	Yes	252 (87.5)
	No	36 (12.5)
Have you received any reward(s) for practicing good food safety?	Yes	122 (42.4)
	No	166 (57.6)

4.5. Factors Associated with Knowledge of Food Handlers

From the total participants, the proportion of males with good knowledge 78.6% was higher than the females 77.2%. There was a significant difference in knowledge among food handlers working in FSEs domiciled in Nyanya 83.3% ($p = 0.005$) and other wards. Those working in Nyanya had significantly better knowledge. Food handlers with working experience greater than 4 years, 87.5% ($p = 0.004$) had significantly better knowledge. Overall, the location of FSEs ($p = 0.005$) and work experience ($p = 0.004$) were factors significantly associated with the level of knowledge of the food handlers.

**Table 5 Factors associated with knowledge of food handlers in Abuja
Municipal Area Council.**

Variables	Knowledge Frequency (n=288) (%)		Pearson Chi- Square	p-value
	Good	Poor		
Age			8.05	0.978
18 to 30 years	129 (77.7)	37 (22.3)		
31 to 40 years	80 (78.4)	22 (21.6)		
41 to 50 years	12 (75.0)	4 (25.0)		
51 years and above	3 (75.0)	1 (25.0)		
Gender			5.27	0.509
Male	92 (78.6)	25 (21.4)		
Female	132 (77.2)	39 (22.8)		
Marital Status			14.44	0.025
Single	128 (81.5)	29 (18.5)		
Married	96 (73.3)	35 (26.7)		
Education Status			22.96	0.192
Not read and write	1 (50)	1 (50)		
Primary	5 (71.4)	2 (28.6)		
Secondary	59 (76.6)	18 (23.4)		
Tertiary	159 (78.7)	43 (21.3)		
Location of FSE			28.49	0.005*
Jabi	138 (76.7)	42 (23.3)		
Lugbe	66 (78.6)	18 (21.4)		
Nyanya	20 (83.3)	4 (16.7)		
Work Experience			26.04	0.004*
<1 years	82 (83.7)	16 (16.3)		

1-4 years	86 (68.3)	40 (31.7)		
>4 years	56 (87.5)	8 (12.5)		
Food safety training			5.72	0.456
Yes	180 (78.3)	50 (21.7)		
No	44 (75.9)	14 (24.1)		

*Significant

4.6. Factors Associated with Food Safety Practices of Food Handlers

From the total participants, the male food handlers, 94.9% had higher proportion of good practices than the females 90%. The food handlers who were 18 to 30 years 94%, and those who were 31 to 40 years, 94.1% had good practice but there was no significant difference between both age group. However, the older food handlers who were 51 years and above, 100% had significantly better food safety practices ($p = 0.001$). Food handlers who could not read nor write 100% had significantly better food safety practices ($p = 0.000$). Food handlers working in FSEs domiciled in Jabi, 100% had significantly better food safety practices, whereas, food handlers working in FSEs domiciled in Nyanya 87.5% had significantly poor practices of food safety ($p = 0.001$). Food handlers with working experience greater than 4 years, 100% had significantly better food safety practice ($p = 0.001$). Food handlers who had received food safety training, 95.7% had significantly better food safety practices than those who had not received food safety training 77.6% ($p = 0.000$). Overall, the age of food handlers ($p = 0.001$), education status ($p = 0.000$), location of FSEs ($p = 0.001$), work experience ($p = 0.001$) and food safety training ($p = 0.000$) were factors significantly associated with the level of food safety practices.

Table 6 Factors associated with food safety practices among food handlers in Abuja Municipal Area Council.

Variables	Practice (n=288) %		Pearson Chi-Square	p-value
	Good	Poor		

Age			71.85	0.001*
18 to 30 years	156(94.0)	10(6)		
31 to 40 years	96(94.1)	6(5.9)		
41 to 50 years	9(56.3)	7(43.7)		
51 years and above	4(100)	0(0.0)		
Gender			5.87	0.826
Male	111(94.9)	6(5.1)		
Female	154(90.0)	17(10.0)		
Marital Status			17.88	0.057
Single	147(93.6)	10(6.4)		
Married	118(90.1)	13(9.9)		
Education Status			70.66	0.000*
Not read and write	2(100)	0(0.0)		
Primary	6(85.7)	1(14.3)		
Secondary	69(89.6)	8(10.4)		
Tertiary	188(93.1)	14(6.9)		
Location of FSE			293.69	0.001*
Jabi	180(100)	0		
Lugbe	82(97.6)	2(2.4)		
Nyanya	3(12.5)	21(87.5)		
Work Experience			33.95	0.001*
<1 years	90(91.8)	8(8.2)		
1-4 years	111(88.1)	15(11.9)		
>4 years	64(100)	0		
Level of knowledge			69.36	0.191
Good	206(92)	18(8)		
Poor	59(92.2)	5(7.8)		
Food safety training			49.94	0.000*

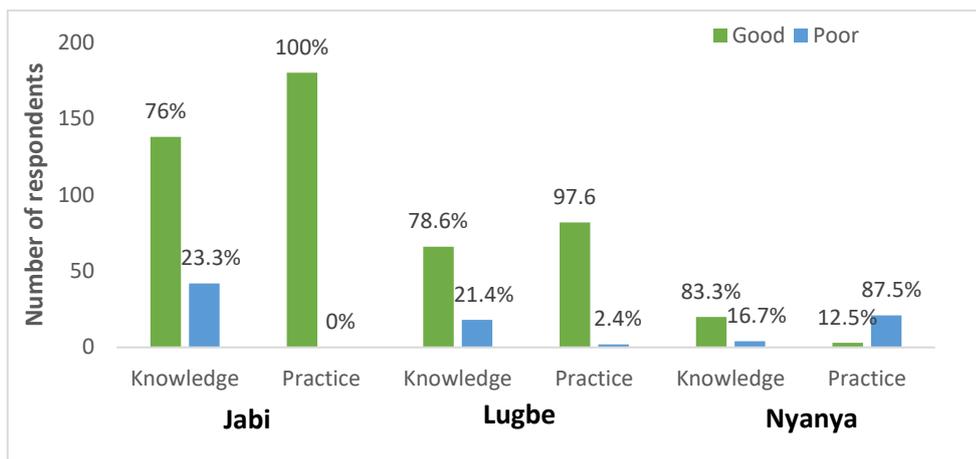
Yes	220(95.7)	10(4.3)		
No	45(77.6)	13(22.4)		
Supervision			10.82	0.371
Yes	235(91.1)	23(8.9)		
No	30(100)	0(0.0)		
Medical check-up			10.72	0.379
Yes	103(95.4)	5(4.6)		
No	162(90.0)	18(10.0)		
Hand wash station with soap and water			16.13	0.096
Yes	211(94.2)	13(5.8)		
No	54(84.4)	10(15.6)		
Reward			18.07	0.054
Yes	118(96.7)	4(3.3)		
No	147(88.6)	19(11.4)		

*Significant.

4.7. The Difference in Levels of Knowledge and Practice of Food Handlers in the Three Wards

The food handlers working in FSEs domiciled in Jabi reported a 100% level of good practice, and the respondents in Lugbe reported 78.6% level of good practice, whereas the respondents in Nyanya reported 87.5% poor level of food safety practice.

Figure 4 Levels of knowledge and food safety practice of food handlers in the three wards.



CHAPTER FIVE: DISCUSSION AND CONCLUSION

5.1. Discussion of Finding

Lack of knowledge on foodborne disease, contamination, transmission and poor food safety practices are significant contributors to the spread of foodborne diseases. Providing insight into the status of the food handlers will help in detecting the problems and proffering solutions to foodborne disease spread among the food handlers in the area. In the current study, more than half (57.6%) of the food handlers fell between 18 to 30 years, and more than half, 54.5%, were single. Like Gondar town, Ethiopia studies, 52.8% and 56.1%, respectively (Yenealem, Yallew and Abdulmajid, 2020). More than half, 59.4%, were female, and the majority (70.1%) had tertiary education. It is like studies in Malaysia 59.7% (Lee et al., 2017) and Imo State, Nigeria (Iwu, 2017), where 74.5% had secondary and above education. Nearly half, 43.8%, had work experience within the range of 1 to 4 years. This finding was minor in a study conducted in Malaysia, 23.9% (Lee et al., 2017) but higher 57.5% in Brazil (Isoni Auad et al., 2019).

Overall, 77.8% of food handlers had good knowledge regarding foodborne diseases, mode of transmission and contamination. This finding is consistent with studies done in Imo State Nigeria 81% (Iwu, 2017), Nsukka Campus University of Nigeria 93.9% (Odo and Onoh, 2018), and North West Ethiopia 79.1% (Chekol et al., 2019) but lower in Northwest Ethiopia 34.1%, where the food handlers were not aware of food-borne disease; its causes, mode of transmission and reason for food contamination (Alemayehu et al., 2021) and also in South Africa (Seabela, 2020). These variations might be due to differences in training.

In the current study, males 78.6% were more knowledgeable than females, 77.2%. This was lower in Northwest Ethiopia 38.9% (Alemayehu et al., 2021) and the reverse was the case in Louisiana State, U.S, where females were more knowledgeable than males (Williams, 2019). In the current study, 48.3% of the food handlers, did not know that wearing gloves is not an alternative for washing hands, and 89.6% did not know that freezing does not destroy micro-organisms that may result in food spoilage and foodborne diseases. Nevertheless, on the contrary, in a study conducted in Brazil, 80% of the food

handlers knew that wearing gloves was not a substitute for hand wash, and 62.5% knew that freezing does not destroy micro-organisms (Isoni Auad et al., 2019). The majority, 93.4%, of the food handlers, were knowledgeable on hand wash with soap and water for 30 seconds, and this was consistent with the study in South Africa (Seabela, 2020), 81% in Imo State Nigeria (Iwu, 2017), but very deficient 17% in a study conducted in Imo State, Nigeria (Onyeneho and Hedberg, 2013). The overall hand hygiene knowledge of the food handlers is high, but the variations in the knowledge of the current food handlers indicate that they need food safety training, especially in hand hygiene. The study also revealed that 92.4% did not know that food not fit for consumption does not always change taste, smell and colour. It is similar with a study done in Brazil, where 67.5% food handlers reported food to always change taste and colour when unfit for consumption (Isoni Auad et al., 2019).

Enabling factors influence the adoption of food safety practices among food handlers. It has been supported by several studies that have been reported to be associated with food safety practices of food handlers. In the current study, the majority, 79.9%, of the food handlers had received food safety training. This result is lower in FCT, Nigeria 32.1% (Ifiadike CO, 2014), 28.4% in Gondar city Ethiopia (Azanaw, Gebrehiwot and Dagne, 2019), Northwest Ethiopia 15.7% (Alemayehu et al., 2021), and Brazil 55% (Isoni Auad et al., 2019). Training has been linked to increase in knowledge. It might have contributed to the level of knowledge of food handlers as 92.2% of those food handlers who received training were also reported to have received the needed knowledge. The majority, 95.1% of the food handlers, requested regular training, and 67.2% of those recommended for the training opted for quarterly training. The proportion of the food handlers whom the Environmental Health Officers supervised were 89.6%. This result is higher than studies in Northwest Ethiopia 47.8% (Chekol et al., 2019), Ethiopia 39.8% (Azanaw, Gebrehiwot and Dagne, 2019) and Imo State Nigeria 45.5% (Iwu, 2017).

More than half, 62.5% of the food handlers had not done their bi-annual medical check-up, and amongst them, 77.2% reported they had medical check-up one year ago. This finding is lower in FCT, Nigeria 28.6% (Ifiadike CO, 2014) and Ethiopia 49.5% (Azanaw,

Gebrehiwot and Dagne, 2019). It shows the high risk of foodborne disease spread among food handlers and the final consumers as they are not regularly screened and treated for foodborne related disease. In a similar study, the health of the food handlers contributed to 64% of the foodborne disease outbreak in New York State (Gould et al., 2013). The majority, 77.8%, of the food handlers had access to handwash stations. This finding is consistent with a study in China 63% (Ji, 2017), lower in Southwestern Ethiopia 42.8% (Okugn and Woldeyohannes, 2018) and New York State, which reported that there was no hand wash station (Miller, 2020). However, were soap and warm water taps in the toilet. Hand wash using soap and running water is recommended since standing water carries microbes, and if hands are not properly washed, they can transmit diseases. More than half, 57.6% of the food handlers, did not receive any reward for practicing good food safety. This finding is similar to a study conducted in Australia where a T-shirt reward and recognition were given for excellence in hand hygiene performance to motivate hand hygiene compliance (Sendall, McCosker and Halton, 2019).

In the practices of the food handlers, 87.5% food handlers washed their hands with soap and running water, 91% washed their hands before and after preparing food, 91% washed their hands after touching money, and 89.2% washed their hands after using the toilet. It indicates a high level of hand hygiene practice. It is consistent with a study conducted in South Africa where 95.4% understand proper hand wash (Seabela, 2020), in Brazil, where 95% washed their hands after preparing food, and 100% washed hands after using the toilet (Isoni Auad et al., 2019), in Southwestern Ethiopia where 52.7% washed hands before preparing food (Okugn and Woldeyohannes, 2018) and in FCT, Nigeria where 89.3% washed hands after using the toilet (Ifeadike CO, 2014).

In the current study, 21.5% use a separate cutting board for vegetables and raw meat. The findings are consistent 39% with the study conducted in Imo State Nigeria 39% (Onyeneho and Hedberg, 2013) and higher in studies conducted in Beijing, China, where 54% owned separate cutting boards while the rest applied the guideline of rinsing the boards thoroughly with water before re-use (Ji, 2017). More than half, 59.8% of the food handlers in the

current study checked food temperature after warming while 40.3% did not check the temperature of food. This finding is consistent with a study in South Africa where 53.8% knew about checking the temperature of food (Seabela, 2020), lower in Beijing China where only 4% knew much about temperature check (Ji, 2017), New York which had a 0% compliance rate to thermometer use (Miller, 2020), and in Johannesburg, south Africa, 100% do not check for food temperature since they do not have the thermometer. It invariably indicates that the food handlers still need adequate food safety training and resources to prevent cross-contamination and the spread of foodborne disease during food preparation.

Overall, the majority 92.1%, of the food handlers had good food safety practices. This finding is lower in Nsukka Campus Nigeria which had a high proportion 64.7% of food handlers with good practice (Odo and Onoh, 2018), studies conducted in Southwestern Ethiopia 51% (Okugn and Woldeyohannes, 2018) Northwestern Ethiopia 53.7% (Alemayehu et al., 2021) and South Africa 66% (Seabela, 2020). Although the food handlers in the current study reported good food safety practices, it is essential to note that their self-reported practice is not enough to indicate their food safety practices. Studies have shown food handlers self-reported practices that conflicted with their observed practices. It can be supported by a study conducted in Brazil, 82.5% food handlers claimed to cover their hair with a cap during food preparation, but only 17.5% were observed to adequately cover their hair during food preparation (Isoni Auad et al., 2019). In another study conducted in Malaysia, food handlers who had a non-compliant coliform count (≥ 20 CFU/cm²) claimed to use gloves frequently when distributing food, while food handlers who exceeded the total aerobic bacteria (≥ 20 CFU/cm²) on their hands claimed to wash their hands before touching food (Lee et al., 2017). These findings shows that food handlers need to be regularly supervised and observed alongside their self-reported practices.

To prevent the spread of foodborne disease, it is important to note the factors associated with the knowledge and practice status of the food handlers in the area. In the current study, the factors significantly associated with knowledge of the food handlers were the location of the Food Service Establishments (FSEs) where the food handlers worked and the work

experience of the food handlers. Out of the total food handlers with good knowledge, 83.3% of those who work in FSEs located at Nyanya had significantly better knowledge ($p = 0.005$) and it can be attributed to the level of education of the food handlers. This finding can be supported by a study conducted in Iraq where location was significantly associated with knowledge (Radhi et al., 2018).

The majority, 87.5% of the food handlers with working experience greater than 4 years had significantly better knowledge ($p = 0.004$). The result was similar to a study conducted in Malaysia, where food handlers who had more years of working experience from 5 years and above, had better knowledge (Lee et al., 2017). The study also revealed that work experience had an impact on food safety knowledge of the food handlers. However, the educational status and the trainings received by the food handlers can also be the reason why those who worked for less than a year still had good knowledge.

In the current study, age of the food handlers ($p = 0.001$) was significantly associated with good food safety practices. Older food handlers 51 years and above, 100% had significantly better practices than younger food handlers. This finding was supported but higher than the study conducted in Iraq, 44% (Radhi et al., 2018) and can be attributed to the food safety training received by the older food handlers.

Educational status ($p = 0.000$) was also another factor significantly associated with good food safety practice. Those with tertiary education 93.1% and those who could not read nor write 100% had significant better practices. These findings are supported but higher than the study conducted in Northwest Ethiopia 65.1% (Alemayehu et al., 2021), Gondar town Ethiopia 62.2% (Dagne et al., 2019) and in Malaysia, where those who had not received any formal education had better practices (Lee et al., 2017). This can be attributed to the fact that food handlers with higher education get better information regarding food safety, while food handlers without any formal education might have been exposed to food safety training.

Work experience ($p = 0.001$) of the food handlers was significantly associated with good food safety practice. Food handlers with work experience greater than 4 years 100%, had significant better practices. It is supported but higher than a study conducted in Gondar town, Ethiopia 59.5% (Azanaw, Gebrehiwot and Dagne, 2019) which indicates they might have been exposed to food safety training. On the contrary, in a study conducted in Iraq, 46.9% of the food handlers with no work experience had a higher proportion of good practice (Radhi et al., 2018).

Food safety training ($p = 0.000$) was significantly associated with good food safety practice. The majority, 95.7% of food handlers, who received food safety training had significant better practices than those who did not receive training. It is supported but higher than a study conducted in Imo State Nigeria 70.3% (Iwu, 2017), and Northwest Ethiopia 62.1% (Chekol et al., 2019).

The location of FSEs ($p = 0.001$) was significantly associated with good food safety practice. food handlers working in FSEs located at Jabi 100% all had significant better practices. This finding is supported but higher than a study conducted in Iraq 49.2% (Radhi et al., 2018). It can also be a result of the elite environment, the food handler's population density and level of education. However, the food handlers working in FSEs located at Nyanya, 87.5% had significant poor practices. In highlighting the differences in the level of knowledge and practice of food handlers in the three wards, most of the food handlers in Jabi, Lugbe and Nyanya had good knowledge, 76%, 78.6% and 83.3% respectively. It can be attributed to the fact that majority of the food handlers in the study had attained tertiary level of education.

Despite the food handlers having a good level of practice, there is a significant difference in the level of food safety practice between Jabi and Lugbe with Nyanya. Food handlers working in FSEs domiciled in Jabi had a 100% level of good practice, those in Lugbe had 97.6% level of good practice, while those in Nyanya had 87.5% level of poor practice. It can be attributed to Nyanya being a low-class environment and the unseriousness of the

FSE managers in implementing food safety guidelines in their facilities. In addition, it is important to note that although knowledge was not significantly associated with food safety, there is no gap in the overall level of knowledge and practice of food handlers in the current study area.

5.2. Conclusion

This study achieved the purpose of evaluating the factors associated with food safety practice of food handlers in the research area. The four objectives which were to assess level of knowledge and food safety practices of the food handlers, assess the factors associated with knowledge of the food handlers, assess the factors associated with the practices of the food handlers, and identify the differences in the level of knowledge and food safety practices in the three wards; Jabi, Lugbe and Nyanya was also achieved. Most of the food handlers in Abuja Municipal Area Council (AMAC) had a good level of knowledge and self-reported food safety practice.

Overall, their knowledge and food safety practice were found high as compared with other studies. There was no association between knowledge and age, gender, marital status educational status, and food safety training. Work experience and location of Food Service Establishments (FSEs) were identified as factors having significant association with the level of knowledge. There was no association between food safety practice and gender, marital status, level of knowledge, supervision, medical check-up, handwash and reward. Age, Educational status, work experience, food safety training and location of Food Service Establishments (FSEs) were identified as factors having significant association with the level of practice.

The overall knowledge of the food handlers translated to good food safety practices, whereas, food handlers were shown to have poor knowledge of contamination, handwashing, and checking food temperature., and also poor practice on use of separate cutting boards and temperature check. More than half of the food handlers had not done their medical check-up and received any form of reward for practicing good food safety;

the majority still recommended that they get food safety training every quarter regularly. Therefore, improving knowledge, medical check-up compliance, increased supervision in areas with low standard practice, through frequent public health awareness campaigns, and training are essential interventions to enhance their level of food safety practice.

5.3. Recommendation

Food handlers must adhere to practicing good food safety always to prevent contamination and spread of foodborne diseases. Hence, the following interventions and recommendation are made based on the findings in the study:

- Food safety training organized by the Public Health Department for all food handlers in FCT Nigeria every quarter and issuance of certificate.
- Food safety training modules include hand wash, gloves, a thermometer and separate cutting boards to avoid contamination and spoilage. Training should not be on instructions alone but also include the science behind the recommendation.
- Mass media campaign on food safety, using Tv programs, radio talk shows, jingles and adverts to promote and educate the public, alongside a celebration of World Food Safety Day in the communities to raise awareness on the essential services to expect in a Food Service Establishment and the spread of foodborne disease.
- Intensive supervision by the Environmental Health Officers especially in the rural and far to reach areas like Nyanya.
- Sending automated messages and reminders to managers of FSEs on the screening of the food handlers before the 6 months period of medical check-up elapses to avoid the risk of foodborne disease spread.
- Creating and updating an online database on foodborne diseases in the State and making it accessible.
- Harmonization of the food handler's database in both the State government and area councils.

5.4. Limitations

Due to fund constraints, all wards in Abuja Municipal Area Council (AMAC) could not be included in the study. In addition, this study did not consider microbiological laboratory analyses of hand hygiene and direct observation of the food handler's practices due to time and funds constraints. Hence, food handler's self-reported food safety practice level might be high because of social desirability bias.

5.5. Future Research

- Assessment of factors associated with food safety practices among food handlers in Nyanya, FCT.
- Assessment of foodborne disease among food handlers in FCT, Nigeria.

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APPENDICES

Appendix 1: Ethical Approval




FEDERAL CAPITAL TERRITORY

Health Research Ethics Committee

Research Unit, Room 10 Block A Annex, HHSS, FCTA Secretariat,
No. 1 Kapital Street 11, Garki, Abuja-Abuja.

Notice of Research Approval
Approval Number: FHREC/2021/01/135/17-11-21

Full Study Title: Assessment of Food Factors Associated with Food Safety Practices among Food Handlers in Abuja Municipal Area Council(AMAC), FCT, Nigeria.

Principal Investigator: Juliet Oluchi Uzoama

Address of Principal Investigator: Graduate School of Public Health, Yonsei University, Seoul, South Korea.

Date of receipt of valid application: 05/10/2021

The FCT Health Research Ethics Committee (FCT HREC) has approved the research described in the above stated protocol.

This approval is valid from **17/11/2021** to **16/11/2022**.

Note that no activity related to this study may be conducted outside of these dates. Only the FCT HREC approved informed consent forms may be used when written informed consent is required. They must carry FCT HREC assigned protocol approval number and duration of approval of the study. The FCT HREC reserves the right to conduct compliance visit to your research site without prior notification.

The National Code of Health Research Ethics requires the investigator to comply with all guidelines, rules and regulations regarding the conduct of health research, and with the tenets of the code.

Modifications: Subsequent changes are not permitted in this research without prior approval by the FCT HREC.

Problems: All adverse events or unexpected side effects arising from this project must be reported promptly to FCT HREC.

Renewal: This approval is valid until the expiration date. If this project is to proceed beyond the expiration date, an annual report should be submitted to FCT HREC early in order to request for a renewal of this approval.

Closure of Study: At the end of the project, a copy of the final report of the research should be forwarded to FCT HREC for record purposes, and to enable us close the project.

For queries and further information contact FCT HREC office. I wish you best of luck with your research.


 Desmond Emereonyeokwe
 Secretary, FCT HREC
 November 17, 2021.



ABUJA
The Heart of Nigeria

Appendix 2: Informed Consent Form

I voluntarily agree to participate in this research project on an **Assessment of the Factors Associated with Food Safety Practices Among Food Handlers in Abuja Municipal Area Council, FCT**, conducted by Juliet Oluchi Uzoama, a student of Yonsei University, Graduate School of Public Health, pursuing a Master's Degree Program in Global Health Policy and Financing Capacity Building.

I understand that the research involves answering written questions which have been fully explained to me and I understand the explanation.

- I have been given an opportunity to ask whatever questions I may have had and all such questions and inquiries have been answered to my satisfaction.
- I understand that I am free to deny any answers to specific questions in the questionnaires.
- I understand that any data or answers to questions will remain confidential with regard to my identity.
- I understand that I am free to withdraw consent and to discontinue participation in the research at any time.
- I am participating in this study of my own free will and I have not been coerced in any way to participate.
- I understand that I may not receive any direct benefit from participating in this study, but my participation may help others in the future.

I have read and understand this information and agree to participate voluntarily.

Please feel free to contact me on the following address for more information:

E-mail: olieezoma@gmail.com

Signature of Respondent: _____ Date: ___/___/___

Signature of Researcher: _____  Date: / /

Appendix 3: English Questionnaire

Part 1 Socio-demographic characteristics of food handlers			
S/N	Questions	Responses	Code
1.	Please what is your age?	1. 18 years to 30 years 2. 31 years to 40 years 3. 41 years to 50 years 4. 51 years and above	
2.	What is your gender?	1. Male 2. Female	
3.	What is your marital status?	1. Single 2. Married	
4.	What is your level of education?	1. Not read and write 2. Primary Education 3. Secondary Education 4. Tertiary Education	
5.	What is the location of your establishment?	1. Jabi 2. Lugbe 3. Nyanya	
6.	How long have you worked with the establishment?	1. Less than 1 year 2. 1 to 4 years 3. Above 4 years	

Part 2 Knowledge of food handlers regarding cause of foodborne diseases, mode of transmission and contamination			
S/N	Question	Responses	Code
6.	Washing hands before and after touching food reduces food contamination	1. True 2. False 3. Do not know	
7.	Wearing gloves is an alternative for washing hands	1. True 2. False 3. Do not know	
8.	Freezing destroys micro-organisms that may result in food spoilage and foodborne diseases.	1. True 2. False 3. Do not know	
9.	A food handler in good health may contaminate food with micro-organisms that results in foodborne diseases	1. True 2. False 3. Do not know	

10.	Food handlers' medical check-up must be done periodically	1.True 2. False 3. Do not know	
11.	Eating food one day after its expiry date is dangerous to health	1.True 2. False 3. Do not know	
12.	Food that is not fit for consumption always changes taste, smell and colour	1.True 2. False 3. Do not know	
13.	Washing fruit and vegetables under running water and peeling is sufficient to make them fit for consumption	1.True 2. False 3. Do not know	
14.	Properly prepared food is free from micro-organisms that results in foodborne diseases	1.True 2. False 3. Do not know	
15.	Food handlers that are unwell do not need to avoid food preparation	1.True 2. False 3. Do not know	
16.	Washing hands with soap and water for at least 30 seconds kills microbes that cause foodborne disease	1.True 2. False 3. Do not know	

Part 3 Food safety practice of food handlers			
S/N	Question	Responses	Code
17.	Do you wash hands before and after preparing foods?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
18.	Do you wash hands after touching money?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
19.	Do you wash hands after using the toilet?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	

20.	Do you use gloves to touch or distribute prepared foods?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
21.	Do you use apron and cap when preparing foods?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
22.	Do you wear nose mask when preparing foods?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
23.	Do you use separate cutting board for fresh vegetables and raw meat?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
24.	Do you check the temperature of food with a thermometer after warming?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
25.	Do you prepare food when you are unwell or presenting any of these symptoms (e.g., cold, diarrhea, coughing, vomiting, fever)?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
26.	Do you use food after it has expired, when there is no change in colour and taste?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	

27.	Do you clean surfaces and kitchen equipment during food preparation?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
28.	Do you clean the kitchen immediately after cooking?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
29.	Do you wash your hands with soap and running water for at least 30 seconds?	1. Never 2. Rarely 3. Sometimes 4. Most of the times 5. Always	
Part 4 Food safety enabling factors			
S/N	Question	Responses	Code
30.	Food Safety Training Are you aware of food safety training course?	1. Yes 2. No	
31.	If no , skip to No. 33. If yes , have you received food safety training in the last 6 months?	1. Yes 2. No	
32.	If no , skip to No. 33. If yes , did the training provide you with the needed knowledge?	1. Yes 2. No	
33.	Will you recommend the training to be done on a regular basis?	1. Yes 2. No	
34.	If no , skip to No. 35. If yes , what duration(s) would you recommend?	1. Monthly 2. Quarterly 3. Bi-annually	
S/N	Question	Responses	Code
35.	Supervision Are you aware that Environmental Health Officers are supposed to	1. Yes 2. No	

	supervise your establishment at least once a month?		
36.	Have you been supervised by Environmental Health Officers in the last 3 months?	1. Yes 2. No	
37.	Medical Check-up Are you aware you are supposed to undergo medical check-up, every 6 months with the Public Health Department?	1. Yes 2. No	
38.	Have you had the medical check-up in the past 6 months with the Public Health Department?	1. Yes 2. No	
39.	If no, when last did you do the test?	1. 1 year ago 2. 2years ago 3. Never 4. Cannot remember	
40.	Hand Wash Do you have a hand wash station with soap and running water?	1. Yes 2. No	
41.	Reward Are you aware of the guidelines for practicing food safety in your establishment?	1. Yes 2. No	
42.	Are you aware of incentives for practicing good food safety by the guidelines?	1. Yes 2. No	
43.	If no , stop at No. 43. If yes , have you received any reward(s) for practicing good food safety?	1. Yes 2. No	