UNIVERSITY OF EDUCATION, WINNEBA

FOOD HANDLING PRACTICES OF INFORMAL FOOD VENDORS AND CONSUMER PERCEPTIONS IN KOFORIDUA

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DECLARATION

Candidate's Declaration

I, Endurance Serwaa Lah declare that this thesis with the exception of references contained in published works which have been identified and acknowledged, is entirely my own original work, and that it has neither in part nor whole been submitted for another degree elsewhere.

Candidate's Signature: ……..

Date: ……..

Supervisor's Declaration

I hereby declare that the preparation of this thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University of Education, Winneba.

Name of Supervisor ……..……

Signature ……....

Date ……

Name of Co-Supervisor……

Signature……

Date ……

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DEDICATION

This work is dedicated to my late brothers Nicholas Rock Hienno Lah and Samuel Providence Odame Lah.

TABLE OF CONTENTS

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

LIST OF TABLES

ABSTRACT

The study investigated the food handling practices of the street food vendors in Koforidua and how their practices affect the safety of the food before consumption, and consumers knowledge of food-borne diseases. The study was a descriptive survey and a sample of one hundred and fifty respondents made up of fifty food vendors and one hundred consumers were purposively and conveniently sampled respectively for the study. The data gathered was analyzed using SPSS Version 17 and converted into frequencies, percentages and tables. The major findings of the study are that majority of the food vendors had knowledge of food safety as well as the laws that govern their operations. Again, the food vendors' knowledge acquired through training programmes did not reflect in their food handling operations. Also, a lot of the consumers patronized street foods because prices were moderate as compared to the formal establishments. Finally, majority of the consumers reported the food at the vending sites was prepared under unhygienic conditions. This study concluded that some of the street food vendors do have some knowledge in hygienic food handling practices through the training they receive but the knowledge they acquired are not put into practice when handling food. Based on the findings of the research, the study recommends that food vendors must be educated on the importance of; certification before selling food to the public, keeping work surfaces clean, separating raw and cooked food in the refrigerator, and using separate equipment for raw and cooked food. The Food and Drugs Authority, the Ghana Tourist Board and most especially The New Juaben Municipal Assembly Health officers, should ensure that, street food vendors in Koforidua are well informed on issues bordering food hygiene and food borne diseases and their effects on consumers.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter discusses the background to the study, statement of the problem as well as the purpose and objectives of the study. In addition, it deals with research questions for the study, the significance of the study, limitations of the study and the delimitation of the study.

1.1 Background to the Study

World Declaration on Nutrition adopted by the Food and Agricultural Organization (FAO) International Conference on Nutrition in December 1992, asserts that adequate access to nutritionally and safe food is a right of each individual**.** As such every individual is entitled to food that is safe and of good quality, since safe food is functional in achieving freedom from hunger and enjoyment of the best attainable state of health. The general well-being of individuals and families all over the world to a large extent depends on the food production chain in their environment, including those who grow, process, market, cook and serve food in various forms for consumption. Anybody who is involved in the production, processing, sale and service of food has a role in ensuring that the final consumer's health is not jeopardized in anyway.

Food safety is a corporate social responsibility since food is a product and its consumption is not just a matter of choice, but is ultimately a matter of life and death (Peattie, 2006). This makes food safety a non-negotiable priority to individuals and families and is equally a priority for governments worldwide because food borne diseases and their consequences have implications for economic growth and development for countries. Governments, law makers, farmers, food manufacturers, caterers, food vendors and all consumers have roles to play in making food safe for

consumption. Food safety can be assured when stringent and careful measures are put in place to prevent, reduce and or remove possible hazards to acceptable levels, through effective training given to food vendors on methods and technologies in safe food handling available.

Studies have shown that the informal food industry plays an important role in cities and towns of many developed as well as developing countries both economically and in meeting food demands of city dwellers (FAO/WHO, 2010). Changing lifestyles and family structures have resulted in changing eating habits and have led to the increased popularity of street foods. In developing countries, the migration of people from rural to urban areas looking for white collar jobs has contributed to increase in the number of people who depend on street food. Rapid urbanization is breaking down traditional family ties throughout the world and the informal food sector is widely understood as an inevitable phenomenon tied to urban growth. Longer traveling times between living and working places are likely to lead to further increases in demand for street food consumption.

The consumption of street food is common in many countries where unemployment is high, salaries are low, work opportunities and social programmes are limited and where urbanization is taking place (FAO/WHO, 2002). Street food contributes substantially to household food spending and provides an income to many female-headed households. It is estimated that street foods contribute up to 40% of the daily diet of urban consumers in developing countries (FAO/WHO, 2002). Workers from industries, government institutions and the general public are compelled to patronize street food especially in the afternoons since the duration for lunch breaks is not sufficient for them to walk long distances to eat in well-established formal food

establishments or at home. In addition to being a significant source of food for the urban dwellers, street food has also in recent years emerged as a tourist attraction.

According to FAO/WHO (2010), street foods show great variation in terms of ingredients, processing, methods of marketing and consumption. They often reflect traditional cultures and exist in an endless variety encompassing meals, drinks and snacks. There is much diversity in the raw materials as well as in the method of preparation of street foods. In addition, there are differences in the places where street foods are prepared and can be broadly grouped as follows. First, food prepared in small-scale food businesses or traditional workshops, second, food prepared in the home, third, food prepared in markets, and food prepared on the street. One of the fascinating aspects of urban social life in Ghana is the widespread presence of street food vendors. Operating from all strategic locations at all hours of day and night, street food vendors serve customers with spicy foods and beverages at reasonable and affordable prices.

Unfortunately, the emergence of informal food businesses can cause health problems if the foods are not prepared and handled properly. Street foods are perceived to be a major contributory factor to food borne diseases, as in most instances, food is prepared in unsanitary environment by people not trained in proper food handling techniques and stored for long periods in unsuitable conditions before selling (WHO, 1984). Although governments all over the world have policies in place to improve the safety of food supply, the occurrence of food borne disease remains a significant health issue in both developed and developing countries. In large scale cooking, food passes through many hands, thereby increasing the chances of food contamination due to improper handling. Deliberate or accidental contamination of food during large – scale production might endanger the health of consumers and have very expensive repercussions on a country (Annor and Baiden, 2011). It has been estimated that each

year 1.8 million people die as a result of diarrhoea and other diseases which can be attributed to contaminated food or water borne diseases (WHO, 2006). Food-borne disease outbreaks that have been reported in the United States for instance, cited mishandling of food and implicated food from commercial or institutional establishments. Codjia (2000) noted that the outbreak of cholera in Peru in 1991 was as a result of poor street food handling practices. In recent years, Ghana has also experienced instances of cholera outbreaks in its major cities and towns such as Accra, Kumasi, and Koforidua. According to Annor and Baiden (2011), numerous studies conducted in Ghana concerning various aspects of food hygiene over the past decade have revealed that most food vendors have poor food hygiene knowledge and attitudes that affects the personal hygiene of the vendors. The Ghana Medical Journal (2006) and the World Bank Food Safety Action Plan (2006) also outlined that, the total number of outpatient cases of food borne diseases reported in Ghana is about 420,000 per year, with an annual death rate estimated at 65,000 and a total cost to the Ghanaian economy at US $ 69 million. Annor and Baiden (2011) stated that an estimated 25% of these reported food-borne disease outbreaks could have been avoided by safe food handling practices.

The Food and Drugs Authority in Ghana has drafted a food safety policy aimed at streamlining various legislations that govern food safety in the country. The key aspects of this policy include the mission and vision of Ghana with regard to food safety, the streamlining of all legislations with regard to food safety, building the capacity of all institutions involved in food safety management, strengthening inspection services, strengthening laboratory services, and strengthening import control. To ensure the safety of food consumed by individuals who patronize vended foods is indeed a global issue which needs to be seriously addressed by all governments.

The motive for this research was to examine the food vendor's knowledge of food borne diseases, their food handling practices, the training facilities available to the vendors and the perception and knowledge of their consumers with regard to the safety of food.

1.2 Statement of the Problem

The ultimate aim of any food service business is to prepare safe and healthy food and serve to customers. Therefore, food handlers need to be aware of food hygiene and apply the food safety knowledge and practices in preparing safe foods. Koforidua being the capital of the Eastern Region of Ghana has a lot of food joints in the informal sector where people from all walks of life go for their daily meals. In recent times however, there have been a lot of reported cases of food borne illnesses at the Regional Hospital as a result of the consumption of vended foods. Food borne illnesses may arise as a result of poor food handling practices by food vendors such as improper storage of cooked food, cross contamination, low standard of personal, hand and environmental hygiene. It is for this reason that the researcher deems it crucial to assess what information street food vendors in Oguaa Koforidua have in relation to food handling practices and food safety. Such an assessment have the potential to identify areas that require strengthening in training programmes with regard to ensuring the safety of street foods, especially for those who patronize them.

1.3 Purpose of the Study

The main focus of this study was to investigate the food handling practices of the street food vendors in Koforidua and how it affects the safety of the food before consumption and consumers' knowledge of food hygiene and food borne diseases.

1.4 Research Objectives

The specific objectives for the study were to:

1. assess food vendor's awareness of food borne diseases and the regulations governing their operations.
2. investigate the current food handling practices of street food vendors in Koforidua with regard to the safety of food.
3. find out whether street food vendors have had any training/education on food hygiene.
4. assess the knowledge of consumers with regard to food hygiene and food borne diseases.

1.5 Research Questions

The study was guided by the following research questions:

1. What awareness do food vendors in Koforidua have on food borne diseases and the regulations governing their operations?
2. What are the current food handling practices of informal food vendors in Koforidua?
3. What training in food hygiene have been given to street food vendors?
4. How may the awareness consumers in Koforidua on food hygiene and food borne diseases be assessed?

1.6 Research Hypotheses

1. There is no significant relationship between food vendors' knowledge of food safety regulations and food handling practices.
2. There is no significant relationship between consumer' patronage of food vending sites and food handling practices.

1.7 Significance of the Study

The findings of this study will reveal to consumers of street vended foods the acceptable food handling practices of food vendors to guide their choice of street foods. Again, the study would draw the attention of the health officers at the New Juaben Municipal Assembly who are responsible for the training, licensing, regulation and supervision of food vendors to identify acceptable food handling practices of the food vendors that need to be encouraged as well as areas of food handling practices that need more attention in order to train them to improve upon those practices. Furthermore, knowledge of consumers of street vended foods on food hygiene and food borne illnesses would be documented in order to educate them on what to look out for when buying street vended food.

It is the hope of the researcher that the statistical information, recommendations, and the conclusions drawn from the findings of the study would be a valuable source of information to relevant stakeholders such as District/Municipal/Metropolitan Health Officers, Food and Drugs Authority, Ghana Tourist Board among others. To prospective researchers information obtained from the study would serve as a relevant reference document for further research.

1.8 Limitation of the Study

The researcher encountered the challenge of having to convince the street food vendors that the information they give would not be used against them, since most of them thought their unacceptable practices would be reported to the authorities in charge of their operations or published in the newspapers. Also, the respondents did not give a clear picture of how they handled food when they realized they were being observed. When participants were aware that an unknown individual was watching their actions

they became more conscious of their food safety activities and performed better and in right instances. The researcher therefore employed the services of research assistants who posed as consumers and observed the food vendors using a pre designed observation checklist without the knowledge of the operators. The conduction of interview, observation and the administering of questionnaire were tedious and time consuming which prolonged the duration for data collection.

1.9 Delimitation of the Study

The study was confined to Oguaa, Koforidua in the New Juaben Municipality in the Eastern Region of Ghana. The Oguaa community was chosen for the study because, it is the centre of the Koforidua township where many businesses, market centers lorry parks and other public places are located and as such street vended foods are easily accessible to consumers. The results therefore cannot be generalized. It was also delimited by the categories of respondents used for the study who were food vendors and consumers of the vended foods and therefore the findings of the study cannot be applied to street food vendors and consumers at other places that are not captured as part of the population for this study.

1.10 General Layout of the Study

The study consisted of six (6) chapters. The first chapter was the introduction which comprised the background and general concepts; statement of the problem, purpose of the study, objectives, research questions, significance of the study, limitations, delimitations and general layout of the report. The second chapter considered the review of related literature on the study. Chapter three dealt with the research methodology. This included the research design, population, sample and sampling technique employed for the study, research instruments, data collection

procedure, and data analysis. The fourth chapter presented and analyzed the data obtained from the field. Chapter five discussed the results obtained in the study and the final chapter six was devoted to the summary of findings, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

This chapter deals with the review of related literature on food handling practices. The literature was reviewed from research articles, journals and books on food handling practices. The literature was reviewed under the following sub-headings; the informal food sector in Ghana, concept of food, street vended foods, food handling practices/food safety, food borne diseases, and knowledge attitude and practice of food handling.

2.1 Theoretical Framework

Some theoretical frameworks have been developed for the study of food handling practices with food safety measures directed towards the prevention of food borne diseases. These frameworks also bring to light all those who are responsible to ensure food safety.

2.1.1 The Hazard Analysis Critical Control Point (HACCP) Model:

The Hazard Analysis Critical Control Point (HACCP) is an internationally recognized system used to identify and manage significant food hazards and ensure food safety for all food business. HACCP can be used throughout all stages of the food chain from primary production to the final consumption, forming an important part of risk-based food safety programmes.

The HACCP systems allow control of food production to ensure that contaminants and hazards are controlled (FAO/WH0, 2002). Significant hazards for a particular food product are identified after a review of all of the processing steps and use of scientific information (Goodrich, et al, 2008). These hazards are categorized into

three types: physical, chemical, and microbiological. The critical control point (CCP) is the point at which the aforementioned hazards are prevented, eliminated, or reduced to safe levels. The National Advisory Committee on Microbiological Criteria for Foods (NACMCF) (1992) defined HACCP as a systematic approach to the identification, evaluation, and control of food safety hazards in foods based on seven principles:

1. Conduct a hazard analysis.
2. Determine the critical control points (CCPs).
3. Establish critical limit(s).
4. Establish a system to monitor control of the CCP.
5. Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
6. Establish procedures for verification to confirm that the HACCP system is working effectively.
7. Establish documentation concerning all procedures and records appropriate to these principles and their application.

The Hazard Analysis Critical Control Point (HACCP) identifies food industry as having the responsibility of ensuring food safety and therefore the one to ensure compliance (Price, Stevenson & Tom, 1993). HACCP is a structured approach that assesses the potential hazards of a food operation and decides which areas are critical to the safety of the consumer. Ignorance about food safety measures among food handlers account for non-compliance (Brown & McKinley, 1982). Food handlers may be aware of the safety practices but other militating factors may hinder their compliance. Under HACCP-based regulatory programme there is a clear delineation of responsibilities between industry and regulatory agencies. Industry is seen as having the primary responsibility for the safety of the food it produces and distributes whilst

the government verifies whether industry is carrying out its role and initiates appropriate regulatory action if necessary. Flyers (2008) posits that, the benefit underlying this system goes for all food sectors and consumers alike; to the government the benefits include among others improved public health, more efficient and targeted food control, reduced public health costs, trade facilitation and increased confidence of the community in the food industry.

HACCP strategy has the potential to make a significant contribution and can facilitate a more pragmatic approach to developing messages that assure effective behavior change (Ehiri, & Prowse 1999). Using HACCP data to promote complementary food hygiene is of paramount importance in situations of extreme poverty and where adequate surveillance of food-borne diseases may be lacking (Ehiri, 1995). The data can be used to inform health and social authorities, train public health personnel, and design culturally appropriate hygiene interventions. In 1993, the Codex Alimentarius Commission endorsed the HACCP system as the most cost-effective approach for ensuring the safety of food. It is however important to note that HACCP evaluations are of little value if the results are not used to educate food handlers to improve hygiene practices and to devise other feasible and culturally appropriate measures to promote food safety. The application of HACCP by food handlers in food industry should be mandatory (Stuart, 2002).

2.1.2 The Compliance Process Model

Henson and Heasman (1998) cited in MacArthur (2007) developed a compliance process model that describes the decision-making process carried out within a business when faced with a legislative requirement. Henson and Heasman (1998) adopted the compliance process model to specifically relate it to small businesses. The compliance process model developed by Henson and Heasman (1998)

consisted of five stages; identification and interpretation of the legislative requirements; specific method of compliance; making a decision to comply; implementing this method and monitoring and evaluating the changes.

The food handler is made aware of relevant regulations through enforcement interventions which can be in the form of inspection visits, training courses, seminars, workshops and written information. A food handler's method of compliance may be influenced by her level of understanding, level of motivation and other beliefs.

Taylor (2001) revealed that certain factors do not motivate small scale enterprises to change the old ways of doing things. Factors include the belief that the existing procedures are safe, presumably because people are not dying from eating the food being produced under unhygienic conditions. Another barrier to compliance identified by Taylor was the remoteness of enforcement. The next phase of the model is where the caterer makes a decision to comply and actually does so.

2.2 The Concept of Food

According to Fosket and Ceserani (2007), food is any substance, liquid or solid that provides the body with materials for heat and energy, growth and repair and for regulating the body processes. Food is also any edible or portable substance (usually plant or animal origin) consisting of nourishing and nutritive components such as carbohydrates, proteins, fats, vitamins and minerals which when ingested and assimilated through digestion sustains the body (FAO/WHO, 2002). Kitagwa, Bekker, and Onyango (2006) also defines food as a composite of natural ingredients normally referred to as nutrients, example protein and carbohydrates, that is needed by man for the maintenance of the body. Potter and Hotchkiss (1998) stated that food is the fuel which supplies chemical energy to the body to support daily activity and the synthesis

of necessary chemicals within the body and is therefore critically needed for survival, growth, physical abilities and good health.

For food to perform the intended functions, it must be nutritionally complete and be free of any injurious substances. A lack or insufficiency of food or consumption of food containing inadequate nutrients may result in dietary illnesses including Pellagra, Rickets, Marasmus, Kwashiorkor and Ketosis or food containing harmful bacteriamay cause food borne diseases such as Cholera, Dysentery, Hepatitis, Salmonellosis and Typhoid (Marriott, 1999; Shapton & Shapton, 1993; Frazier & Westhoff, 1988).

2.3 Emergence of Street Foods in Ghana

According to Tomlins, Johnson, Obeng-Aseidu, Myhara and Greenhalgh, (2002), before Ghana's independence, the capital city Accra was sparsely populated and meals were prepared and eaten at the family or individual level. Food vending existed only in the form of food prepared at home and sold on a take-away basis. Ghana's independence in 1957 promoted industrial development and brought about new sources of employment. People began to work away from their homes and their traditional working environment. Those who could not carry food to their places of work had to be catered for. This led to cooked food, snacks and fruits being sold to customers by vendors. According to Ayeh-Kumi, Quarcoo, Kwakye Nuako, Kretchy, Osafo- kantanka and Mortu (2009) the food industry grew rapidly and food vendors could be found around offices, factories, schools, markets, construction sites, beaches, lorry stations, commercial centres, and along almost every street of Accra as well as other cities and towns. The industry has now been recognized as part of the informal sector of the Ghanaian economy. The operations 4 fast food joints, restaurants and chop

bars have increased in most communities especially in urban areas). Currently, the increasing number of working population in the country has caused a lot of changes in the eating habits of people from all walks of life. In view of this many people including children and travelers now eat breakfast lunch and at times supper outside the home.

2.3.1 Street-Vended Foods

The FAO/WHO Codex Alimentarius Commission defines "street-vended foods" or "street foods" as ready-to-eat foods prepared and/or sold by vendors and hawkers especially in the streets and other public places (WHO, 2010). Another study explained street food vending as a prevailing and distinctive part of a large informal sector which is commonly seen in public places, particularly in the cities, and is distinctive in the sense that it provides a basic need to urban inhabitants (Muzaffar, Huq & Mallik, 2009). Those who prepare and/or sell street foods can be regarded as small-scale operators or micro-entrepreneurs that form part of the informal food sector. This is distinct from the formal-sector food industry in a number of ways because many individuals in the rapidly increasing urban populations of developing countries have not been absorbed into the formal organized labour market, they have a range of self-employed, small scale, income-generating activities, both legitimate and illegitimate, which form the informal sector (WHO, 2010).

The FAO (1990) posits that there are different types of food vending sites including mobile stalls, a variety of push-carts, roadside stands, and hawkers depending upon the ingenuity of the individual, resources available, type of food sold and the availability of other facilities. Escalante de Cruz (2003) categorized street food into three main groups, namely 'mobile' vendors, 'semi-mobile' vendors, who may be stationary or move from one site to another and 'stationary' vendors who sell their food

at the same site each day. Campbell (2011) also explained that with regard to mode of selling, street food vendors sell their wares from small stalls and kiosks and are the predominant type in most of the countries studied. The street food vending business is thought to contribute significant income inflows for households involved in selling these foods. The types of street foods sold vary greatly between countries. Most meals consist of the staple food served in various forms and in combination with side dishes such as stews, gravies and spices. In addition, snacks such as dried meat, fish and cereal based ready to eat foods are also prepared and served. Street food vending is therefore a source of a wide range of foods that may be nutritionally important for various groups of the population.

Street food vendors usually take their products to their customers and therefore operate from such places as bus terminals, industrial sites, market places and other street corners where there are ready and numerous clienteles. Unfortunately, these locations usually do not meet all food safety requirements. For example, large amounts of garbage accumulate and provide harborage for insects and pests. The utensils used are also of a nature that may lead to contamination, especially through leaching of toxic heavy metals or simply due to unsanitary exposure to the environment. It is also postulated that street-food vendors, owing to their lack of or no education as well as being poor, lack an appreciation for safe food handling. Consequently, together with the surroundings in which food is prepared and sold, street food is perceived to be a major public health risk (Leus, Mpeli, Venter, & Theron, 2006). However, FAO (2007), have maintained that food prepared on the street can be safe, thereby providing alternative outlets for consumers.

The street food trade has become an important source of employment, particularly for women who are quite often the victims of poverty (Maxwell, 2000). A

survey conducted by FAO (2002) in West African countries confirmed that in West Africa the success of the street food vending sector is largely attributed to female labour. Women represent between 89 and 98% of the total sample interviewed and their age ranges between 33 and 49 years. This data only partially represents the total number of women informally employed in street food vending as it fails to capture the army of mothers, sisters, daughters who stay in their houses preparing the food for sale. Women supply the ingredients (managed by market queens), the transportation, the preparation and selling of the products. Thus, women are largely engaged in the entire food supply chain.

Street food is a source of livelihood for people who otherwise could not have been able to establish a business for lack of capital. In Cotonou in the early 1990s, it was estimated that the turnover of the street food trade was about US$ 20 million. A mini-census and a survey by the National Resources Institute involving 334 street vendors in Accra, Ghana, indicated that the street food sector employs over 60,000 people and has an estimated annual turnover of over US$100 million (Codjia, 2000). Again, in a longitudinal study conducted in Ghana, street foods accounted for 19% to 27% of food expenses and provided 134-417 kcal per day per person (Campbell, 2011). Overall, consumer spending on street foods represents a significant proportion of the household budget. Codjia (2000) noted that in Abidjan, 20% of meals were taken outside of the home and most of these were purchased from street vendors. Maxwell (2000), reported that in Ghana almost 40% of the total food budget goes to purchasing street foods. Street foods play significant nutritional role for consumers, particularly for middle and low-income sectors of the population, who depend on street foods for their main food intake (Mensah, Yeboah-Manu, Owusu-Darko, & Ablordey, 2002). The FAO added that street foods provided nutritionally balanced diets, sufficient in quantity

and presenting options for variety and choice for consumers, particularly from middle and low-income sectors of the population, who depended heavily on them (FAO, 1997).

2.3.2 Selling of Street Foods

According to Food and Drug Authority (2013), hygiene measures adopted in selling street food include the points of sale, whether stationary or mobile should be in good condition and meticulously cleaned, especially surfaces on which the food will be placed. Foods that are displayed for sale should be protected from dust, insects and exhaust fumes with lids, glass panes, plastic sheeting or other materials that are easy to clean and that do not release toxic substances. Again, displayed street food should be protected from contamination by surroundings and kept at appropriate temperatures. For example, food that is served hot should be 60°C or more (high temperature) and food served cold should be 7°C or less (low temperature). Plates and utensils used by customers, whether with leftovers or not, should never be licked by domestic animals, such as dogs and cats. Food to be taken away should be wrapped with plastic or any other appropriate clean material. Newspaper, and cement bag paper are unhygienic wrapping materials and should not come into direct contact with the food.

According to FAO (2010), Customers should be provided with means to wash their hands, including washing under running water or individual bowls with water and detergent soap. Reheated food should never be returned to the refrigerator, it should be consumed or what is left should be thrown away. A study by Mwadime (2001) reported that printed papers were the major packaging media in street foods in Nairobi. Annan-Prah, Amewowor, Osei-Kofi, Amoono, Akorli, Saka and Ndadi (2011) in a similar

study also observed that 6% of street food vendors in Cape Coast Ghana use newsprints, and 20% polythene bags to package food.

2.4 Sources of Food Contamination

Ready to eat food naturally contains some levels of both harmful and safe bacteria. However, the provision of favourable conditions allows bacteria to grow to sufficient numbers to cause health problems (Rande, 1996). Out of the eight most cited sources of food contamination. Micheals (1989) isolated cross contamination as the most singular source responsible for food contamination. Cross contamination is the process where harmful bacteria are transferred to food. The transfer could be direct contact between one food and another; from food handlers who do not wash their hands between handling raw and cooked food; or indirect contact, which is between equipment and improper storage practices (Fosket & Ceserani 2007). Green and Selman (2005) also noted that the most common source of food contamination is humans especially when the hand gets into contact with food items. The Center for Disease Control (CDC) (2010) indicated that hands are the cause of most enteric virus transmissions.

Fosket and Ceserani (2007) opined that the major food contamination sources are water, air, dust, equipment, sewage, insects, rodents and human activities. Contamination of raw materials can also occur from the soil, live animals, external surface and internal organs of animals. Fosket and Ceserani (2007) stated that food can be contaminated through the following ways:

1. Chemicals that entered the foods accidentally during the growth, preparation or cooking of the food for instance those from pesticides and clearing fluids.

2. Germs (harmful bacteria) that have entered the food from humans, animals or other sources of the bacteria themselves or the toxins produced in the food. Thus, the greatest numbers of cases of food poisoning are caused by harmful bacteria.
3. Bacteria and viruses that have come from people, animal, insects, raw food, rubbish, dust, water and air. The bacteria or toxins produced in the food causes the food to become harmful.

Owing to conditions under which street foods are sold, there is concern that food may be contaminated by heavy metals and pesticide residues. These contaminants may come from the utensils, raw materials, or transport methods used and may also occur due to the lack of appropriate storage facilities (Mensah, Manu, Darko, & Ablordey 2002).

A study carried out in Accra revealed that street food vendors purchased their pots and other utensils from both formal and informal manufacturers/retailers. Some of the street food samples had higher levels of lead, cadmium, arsenic, mercury, and copper than average food samples, suggesting possible leaching from the utensils. Further tests showed that lead from the pots obtained from informal manufacturers could leach into the food. These pots are manufactured using scrap metal that could come from diverse sources such as derelict cars, car batteries and industrial machinery, which are obviously not suitable for use with foods. Therefore, their continued use must be discouraged (Mensah *et al.*, 2002).

Microbiological analysis of samples of certain street-vended foods have shown high levels of total Coliforms and in some cases the presence of pathogenic bacteria such as *Salmonella spp*., *Staphylococcus aureas*, *Clostridium perfringens*, and *Vibrio cholera* (Hanoshiro, Morita, Matte, Matte &Torres (2005); Ghosh, Wahi & Ganguli,

2007). Numerous studies have been documented on the potential contamination of street foods by pathogenic microorganisms (Micthel, Freser, & Lucile, 2007). A study on the microbial quality of street foods in Accra, Ghana found evidence of *Shigella sonnei, Enteroaggregative Escherichia coli* and *Salmonella arizonae* in some of the food samples (Mensah *et al*: Feglo & Sakyi 2012).

Muinde and Kuria (2005) found houseflies in most of the street food stalls in Nairobi. Mwadime (2001) found houseflies in 54.8 % of the vending stalls. This implies that food contamination is most likely to occur despite efforts to keep the stalls clean. This is due to the fact that houseflies are believed to pass on pathogens mechanically onto food. *Salmonella tphinurium* and *Shigella,* for instance, can multiply in the gut of flies and be excreted for weeks or longer.

Food stalls often lack the necessary storage (refrigeration and cooking) facilities to prevent contamination by bacteria. Limited access to clean water and improper waste disposal practices increase the risk of contamination being passed on to customers. Adequate temperature in cooking and storage of foods is important to minimize the growth of bacteria and the food that cannot maintain within the safety temperature zone may act as incubator for pathogenic bacteria whether the food is raw, partially cooked or fully done (Roller, 1999; Abdalla, Sulima. & Bakhiet, 2009). Bhaskar, Usman, Smitha and Bhat (2004) and Mosupye and Holy (2000) reported that, bacteria from dirty dish washing waters and other sources on utensil surfaces constitute a risk for contamination during food vending.

2.4.1 Cross-Contamination

When raw food products come into contact with any surface, piece of equipment, utensils, or even the food service employees' hands, those surfaces become

contaminated with microorganisms. Cross-contamination is defined as the point where microorganisms are transferred from one surface to another (Roberts, Barrett, Howells, Shanklin, Pilling & Brannon, 2008). The human hands are among the obvious culprits of transferring bacteria from raw to ready to eat food. Findings by Muinde and Kuria (2005) in a study conducted in Nairobi reported that 60% of street food vendors (n = 80) handled food with their bare hands.

Direct contact with raw foods, dirty chopping boards, knives and other cooking implements can also spread the contamination. Chopping boards, plates and knives that have been in contact with raw food need to be carefully washed with hot water and detergent, then rinsed and thoroughly dried before being used for ready to eat foods. Food and kitchen tools may become contaminated from raw food products such as meat and poultry. A study conducted in Ghana by Nahami and Odonkor, (2012) revealed that a majority (53.81%) of respondents used the same knife for both raw fresh produce and ready-to-eat food items. Disturbing percentages of 31.43% did not apply any treatment to the knife in-between use, 20.95% rinsed with only water and) 8.75% wiped the knife with a towel which may not be washed regularly.

2.4.2 Preventing Cross-Contamination

Cross-contamination can be fairly easy to prevent as long as food handlers are properly trained to recognize where microorganisms thrive and how microorganisms are transferred. The following factors outlined by Minnesota Department of Health Consumer Fact Sheet (WHO, 2007) should be considered by food handlers in their quest to prevent food borne disease:

1. When shopping separate raw meat, poultry, and seafood from other foods in grocery-shopping cart.

2. Place raw foods in plastic bags to prevent their juices from dripping onto other foods. It is also best to separate these foods from other foods at check out and in grocery bags.
3. When refrigerating food, place raw meat, poultry, and seafood in containers or sealed plastic bags to prevent their juices from dripping onto other foods, since raw juices often contain harmful bacteria.
4. Store eggs in their original carton and refrigerate as soon as possible.
5. Hands should be washed with soap and hot water before and after handling food, and after using the bathroom, changing diapers; or handling pets.
6. Use hot, soapy water and paper towels or clean clothes to wipe up kitchen surfaces or spills.
7. Wash cutting boards, dishes, and counter tops with hot, soapy water after preparing each food item and before you go on to the next item.

The Minnesota Department of Health Consumer Fact Sheet (WHO, 2007) went on to indicate that, clean cutting board should always be used and if possible, food handlers should use one cutting board for fresh produce and a separate one for raw meat, poultry, and fresh fish. Once cutting boards become excessively worn out or develop hard-to-clean grooves, they should be replaced. Fruits and vegetables should be washed thoroughly under running water to remove all visible dirt. Remove and discard the outermost leaves of a head of lettuce or cabbage.

2.5 Food-Borne Illness

WHO (2010) defined food borne illnesses as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food. They encompass a wide spectrum of illnesses caused by microbial, parasitic or chemical

contamination of food. Common symptoms of food borne illness are diarrhoea, vomiting, fever, nausea, abdominal pains, and jaundice. Individuals who are sick with a food borne illness will not share all of these symptoms. Food borne illnesses and symptoms can range from thirty minutes to as long as six weeks. The health and wellness of the individual dictates the severity of the illness. Certain groups of people have a higher risk of getting food borne illness (Payton, 2013). The populations at high risk for food borne illness are elderly people, young children, pregnant women, and people with compromised immune systems.

Food borne diseases are a growing public health problem worldwide (WHO, 2010). This is because, there seems to be a change in life-style and food consumption patterns such as frequency of "eating out" is increasing while and preparation of food at home is decreasing. Diarrhea diseases due to contaminated and unhygienic food are among the leading causes of illness and deaths in low-income countries, and several outbreaks of disease have been attributed to the consumption of street food (Rheinlander, Olsen, Bakang, Takyi, Konradsen & Samuelsen, 2008) The number of reported outbreaks of food-borne illnesses has been high, both in developed as well as developing countries (Osaili, Abu, Obeidat, Bawadi, Tayyem & Subin, 2013). However, the problem is exacerbated in developing countries due to economic reasons, poverty, the lack of adequate health care facilities, and the lack of data regarding food-borne diseases.

According to the WHO (2000), food contamination in developing countries is caused by many factors including traditional food processing methods, inappropriate holding temperatures, and poor personal hygiene of food handlers. Further, the prevalence of food-borne illnesses in developing countries is intertwined with other economic and developmental issues such as legislation, infrastructure and enforcement

mechanisms. Specific examples include inadequacy of food safety laws, laxity in regulatory enforcements, and the lack of education for food handlers.

Reliable epidemiological estimates on the burden of food borne diseases are important in order to assess the impact of food safety measures and advise policy-makers on the cost-effective use of resources. To date, however, no precise and consistent global information exists (WHO, 2010). In 2007, a total of 1097 food borne illness outbreaks were reported to the Center for Disease Control Prevention (CDCP), which resulted in 21,244 cases of food borne illness and 18 deaths (Liu, 2010). CDCP again estimates that each year roughly 1 in 6 Americans (or 48 million people) get sick, 128,000 are hospitalized, and 3,000 die of food borne diseases. A number of outbreaks have recently been reported in Ghana. For example, four persons died in Sheho (Upper East Region of Ghana) after eating contaminated meat (Ghana News Agency April, 2013). Also, a cholera outbreak in Atebubu (Brong Ahafo Region) claimed nine lives, while another outbreak resulted in the death of one person in Obuasi (Ashanti Region) and the hospitalization of over 50 victims. It has been estimated that about 5000 children under five years of age die from diarrhoea each year in Ghana (Monney, Agyei, & Owusu, 2013).

Other studies have revealed that the current estimates of 1.8 million deaths worldwide annually only represent a fraction of the entire situation on the ground. Obtaining global estimates is further complicated in that when data obtained from various countries are pooled to derive regional or global estimates, the influence of the study design and existing surveillance systems on those estimates have to be considered (Flint, *et al.*, 2005). The South African Department of Health recognized that food borne disease outbreaks are under-reported. Since most diarrhoea illness resolve within 24 to 48 hours without any medical attention, many food-related illnesses are not

diagnosed and associated food borne disease outbreaks are often not recognized (South African Department of Health, 2009). The Department of Health postulates that when people do seek medical attention health workers are less likely to report these less severe conditions, thus posing a challenge to the health care system to maintain the knowledge and resources to identify and respond to these outbreaks (South African Department of Health, 2009). The Ghana Medical Journal Commentary on Food Safety (2006) also confirmed this assertion by highlighting that studies conducted in Ghana revealed that the incidence of food related infections is grossly under-reported in the country because only the very serious episodes are taken to the hospital. Invariably only severe outbreaks may be properly investigated to identify the causative age.

Factors Responsible for the High Prevalence of Food-Borne Diseases

Van der Heijden, Younes, Fishbein and Miller (2000) and Kitagwa *et al* (2006) have stated that despite the fact that the etiology and mechanism for prevention and control of many food borne diseases are well known, the knowledge is often not applied in practice, even by health professionals. McSwane, Rue and Linton (2000), and Van der Heijden *et al.* (2000) and Kitagwa *et al.* (2006) explained lack of application of existing knowledge to be due to the following factors:

1. Lack of basic sanitation as well as use of untreated night soil as fertilizer introduce pathogens into the food chain.
2. Time and temperature abuse.
3. Poor personal hygiene and improper hand washing practice.
4. Cross-contamination.
5. Contaminated ready-to-eat foods such as salads.
6. Lack of knowledge about food safety measures.

7. Lack of fuel for cooking and inappropriate food storage facilities.
8. Rapid increase in population growth combined with massive migrations to urban areas has led to the formation of urban centers of high population density.
9. Improved standards of living have led to the increase in consumption of food of animal origin, which has increased the risk of exposure to meat and poultry borne pathogen.
10. Change in lifestyles due to urbanization, has led people to eat more home meat replacements in food establishments.
11. Lack of educational programmes for food handlers.
12. Tradition and beliefs such as considering babies stool not to be dirty and eating raw meat, milk and fish despite the risks that they pose.
13. Increasing number of international travelers.
14. Failures/errors during food processing.
15. International trade in food and animal feed.
16. Increase in urban population has outstripped the development of the health related infrastructure including basic sanitation.

2.5.2 Prevention of Food-Borne Illness

The FAO (2005) stated that the street food industry has an ethical and moral obligation to serve customers with food that is safe. Improper holding time and temperature, poor personal hygiene, and cross contamination are risk factors that are directly related to food handling practices of foodservice employees and are preventable if proper food safety practices are followed. To ensure the safety of food, specific procedures including time and temperature control, good personal hygiene maintenance, and minimizing cross contamination must be followed. The National

Restaurant Association Educational Foundation (NRAEF) (2004) indicated that microorganisms grow fastest between temperatures of 41ºF to 135ºF, therefore, when heating, cooling, or holding foods prior to service the potential is great for bacteria to multiply if not heated to the proper temperature, held at the proper temperature, or if held too long at unsafe temperatures. Potentially hazardous foods must be cooked to the United States Department of Agriculture (USDA) recommended temperatures. The temperatures include 135ºF for commercially processed hot foods; 145ºF for fish, fresh shell eggs that will be served immediately, and whole red meat items; 155ºF for ground or injected meats; and 165ºF for poultry, stuffed meats, and any food cooked in a microwave oven. Once cooked, hot food must be held at an internal temperature of 135ºF or higher and cooled to 41ºF within four hours (NRAEF, 2004).

Good personal hygiene is essential in preventing food borne illnesses. Hygiene is the science of preserving health. It involves all measures that ensure the safety and quality of food during its handling (Jay, 2000). Fosket and Ceserani (2007) also stated that hygiene is the science and practice of maintaining health and preventing diseases in every catering establishment that provides food. Hygiene ranges from personal hygiene through domestic hygiene up to occupational and public health. Therefore, an attempt should always be made to protect people and the environment from bacteria so as to prevent contamination of the food that people consume (WHO, 2010).

Every person engaged in the preparation, manufacture, serving, packing, cooking, carriage, handling, sale, or delivery of any food for human consumption needs to consider the following (Fosket & Cesereni, 2007).

1. Keep body clean by washing and bathing (the hands should be washed every time when entering food preparation area/ kitchen).

2. Hands and arms should be washed thoroughly using water and soap after each visit to the toilet.
3. Avoid the use of common towel (paper towels/tissues or hot air driers are preferable).
4. Wear clean and washable overall or apron preferably white.
5. Keep hands away from nose, mouth, hair, and eyes during work.
6. Do not handle unclean eating, drinking, or culinary articles.
7. No smoking, sneezing and chewing in culinary department,
8. Do not use your mouth to blow air into plastic bags to open it.
9. Do not lick fingers to pick up papers.
10. Use spoons, fork or tongs to transfer food.
11. All wounds and cuts should be well covered.
12. Food service attendants should not work when suffering from cough, influenza, diarrhea, vomiting or any other contagious diseases.

The World Bank (1995) asserts that safe water is an essential pillar for health. Latham (1997) also posits that personal hygiene can only be achieved if adequate water is available. The National Restaurant Association Educational Foundation (2004) explained that hand washing is one of the fundamental practices that decrease the spread of food borne illnesses. Bhaskar, Usman, Smitha and Bhat (2004) also reported that defective personal hygiene can facilitate the transmission of pathogenic bacteria found in environment and on people's hands via food to humans. While it may seem like a basic practice in foodservice establishments, research has shown that as many as 60% of food handlers do not wash their hands often enough or properly.

As stated earlier, hand washing is emphasized as the single most important measure to prevent cross contamination, yet the largest ever survey of catering staff conducted by the Food Standard Agency of the Public Health Division, Edinburgh in 2002 shows that 1 out of 3 does not wash their hands after visiting the lavatory.

The research also identified that half of the participants interviewed did not wash their hands before preparing food. If a food worker is not clean, the food can become contaminated (McSwane, Rue, & Linton, 2003). Food workers may transmit pathogens to food with hands that are contaminated with organisms from their gastrointestinal tract which leads to food borne illness. Due to this reason improvement of food worker hand washing practices is critical (Green, Selman, Radke, Ripley, Mack, Reimann, Stigger, Motsinger & Bushnell, 2006). To ensure proper hand washing food handlers must wet their hands under running water of at least 100ºF, apply soap, vigorously scrub hands and arms for at least 20 seconds, clean under fingernails and between fingers, rinse thoroughly under running water of at least 100ºF, then dry hands and arms with single-use paper towels or a clean dry towel (WHO, 2006). The use of fabrics, cloths, dish towel or apron for hand drying must be discouraged as it can rapidly accumulate a large population of micro-organism, particularly when left moist and their use can actually increase food contamination rather than reduce it.

Food workers must also consider hand care in conjunction with proper hand washing to help prevent the transmission of microorganisms. A food worker should have short and clean fingernails. In addition, false fingernails should never be worn. False or acrylic fingernails trap debris and could become a physical hazard as they may lose their adhesiveness and break off into the food being prepared, thus contaminating the food and causing physical hazard (Washington State Department of Health, 2005).

A food worker must never touch "Ready to Eat" (RTE) food with their bare hands since this can place the food in direct contact with a surface that contains dangerous microorganisms. Food handlers should wear gloves when in the kitchen or preparing food, when preparing raw meat or poultry, when hands have cuts or scratches, and when preparing RTE foods (Green & Selman, 2005). Food handlers should change their gloves as soon as they become soiled or torn, before beginning a different task, every four hours during continual use or more often when necessary, after handling raw meat and before handling RTE food and wash hands with every glove change (Green & Selman, 2005). Researchers argue whether glove use has led to less hand washing practices in food handlers. Studies have suggested that glove use might be counterproductive because workers might wash their hands less frequently (Lynch, Phillips, Elledge, Hanumanthaiah, & Boatright, 2005). In an observational study of hand hygiene actions, only 30% in the instances observed did food handlers correctly perform proper hand washing at the appropriate times in which they should have washed their hands (Clayton & Griffith, 2004).

The FAO (1997) stipulates that environmental hygiene of premises is very crucial. Depending on the nature of the food preparation, vending operations, and associated risks, the premises and utensils should be designed and fitted in such a way that they are easy to maintain and disinfect to ensure that food contamination is kept at a minimum. Street food preparation and vending sites should be at least 15 meters away from refuse dumps and latrines. The food should be prepared in a clean and well lit area, sheltered from sun, dust and wind, and far from all sources of contamination, such as solid waste, domestic animals, insects, rodents among others. Fixed or mobile vending points should be located in an area where the risk of contamination from refuse, wastewater and other harmful or toxic substances is nil or minimal. If that risk cannot

be totally eliminated, the displayed food should be covered and protected from contamination.

2.6 Educating/Training Food Vendors on Food Safety and Certification

Educating street food vendors in safe food handling and personal hygiene can improve the safety of street foods, protect this important sector of the economies of poor countries and heighten consumer protection. Observational studies have revealed that food workers frequently engage in unsafe food preparation practices (Green & Selman, 2005). Street food vendors are often poorly educated and untrained in food safety. They often work under unsanitary conditions with little or no infrastructure support. According to WHO (2006), food handlers should have the necessary knowledge and skills to enable them to handle food hygienically. Systems should be put in place to ensure that food handlers become aware of all procedures necessary to maintain the safety and suitability of food. Moreover, food will remain safe as long as critical behaviors are observed in food handling (McCabe-Sellers & Beattie, 2004).

Research has shown that majority of food-related illnesses and death could be controlled, or eliminated, by the use of proper food handling techniques (Hapala & Probart, 2004). Therefore, education and training of street-food vendors may offer the most cost-effective way to reduce the incidence of food borne disease. The FAO/WHO (2006), and Chukuezi (2010) stated that food vendors are required to undergo basic training in food hygiene before licensing and further training as required by the relevant authorities. This is because inadequate hygiene training and/or instruction and supervision of all people involved in food related activities poses a potential threat to the safety of food and its suitability for consumption. Since poor personal hygiene, cross-contamination, and time-temperature abuse are the three main causes of food

borne illness, there is the need for food safety and sanitation training to be conducted and maintained on a regular basis in foodservice establishments (Pilling, Brannon, Shanklin, Howells, & Roberts, 2008).

Food safety training attempts to improve employees' food safety practices. Furthermore training is a tool needed to make food workers aware of the hazards associated with foods and the food safety practices that must be used to prevent food borne illness (Bryan, Caroline & Madelon, 2003). Again, effective nutrition education programmes for school children and other key community groups are essential means of equipping street food customers with the knowledge necessary for making healthy food choices. Thus, the safety of street-vended food can be improved if a sufficiently high proportion of vendors receive training in basic hygiene skills. Research has shown that the key to preventing food borne disease is to educate and train food handlers (Clayton & Griffith, 2008). A study by Gettings and Kiernan (2001) validates previous research emphasizing the important role educators can play in food safety education and extends the implications to the high-risk population (Finch & Daniel, 2005). A study in Oklahoma County found that there was no significant difference between the number of hours of training and improvement of food safety practice (Lynch, *et al*, 2005).

In view of this the development of training materials for vendors has to be tailored to meet their needs and situations. One of the most important aspects of food safety training is being able to match the content and format of the training with the needs and learning styles of the learners. The street food industry is noted for having a very diverse workforce. For many employees, expressing themselves in the English language is very difficult. This can create significant communication barriers when trying to teach food safety principles and practices (McSwane, 2010).

Five Keys of Safer Food designed by the WHO (2007), was successfully utilized in an evidence-based training programme for vendors to improve their food handling practices. WHO (2009), again published a "Train the trainer course" on the Five Keys to Safer Food which builds upon the safe food handling behaviours developed for the Five Keys to Safer Food Poster. Rowell's (2011) study suggests that many individuals in the food service industry have some form of training. However, a study conducted in Kumasi, Ghana by Rheinländer, Olsen, Bakang, Takyi, Konradsen, and Samuelsen, (2008) found that many vendors do in fact have sufficient knowledge to ensure hygienic handling of food, such as knowledge of the dangers of faecal contamination and serious food borne diseases, but the knowledge was not turned into safe practices, not even by those vendors who had obtained formal training in cooking.

Due to the lack of studies and clarity on the impact of training on food safety behaviours within the food industry, Nieto-Montenegro, Brown and LaBorde (2008) undertook a study that looked at developing and assessing a pilot food safety educational material and training strategy for Hispanic workers using the Health Action Model (HAM). HAM takes into account the social and environmental factors around the worker that may impact on adoption of behaviours (Tones, Tilford, & Robinson, 2001). Seaman and Eves (2006) indicated that the Health Action Model gives the most thorough description of factors that may influence behaviour change following hygiene training.

2.7 Food Handling Practices

The Ghana Public Health Act (2012) defines food handling as manufacturing, processing, producing, packing, preparing, keeping, storing, transporting or displaying food for sale or for serving. Increased handling of food is responsible for a more complicated and critical challenge of protecting food from contamination. Good

hygiene practice in food preparation and food service plays an important role in ensuring food safety. This is achieved by following the general rules of good food hygiene and other approaches like HACCP. Fosket and Ceserani (2007) stated that poor hygienic practices can contribute to outbreaks of food borne illnesses. It is therefore important that food establishment management/owner provides methods and means of handling that prevent damage to or deterioration or contamination of any food product.

2.7.1 Receiving Food

At delivery food handlers should visually inspect product. Food should ideally be stored on shelves at least six inches off the floor. The six inch allowance will allow for easy cleaning and will discourage pests while the shelves will assist in air circulation. Open food should be stored in covered containers and raw foods should be stored under cooked or ready-to-eat foods to avoid cross contamination (such as dripping). All foods should be properly marked and dated and at no time should chemicals be stored in the same area with the food.

2.7.2 Storage of Food

All foodstuffs undergo unwanted changes during storage if not kept under proper conditions. Foods are divided into three main groups for the purpose of storage; they are perishable foods, dry foods and frozen foods. Perishable foods include meat, poultry, game, fish, dairy produce, fats, vegetables and fruits, are obtained on daily bases for use. Dry foods include cereals, pulses, sugar, flour among others. Cool refrigeration, frozen and dry storage are among the methods of food preservation. Cool storage refers to storage at temperatures above freezing point from about 16^0C down to -2^0C while frozen refers to storage at temperatures -18^0C or below to maintain food (Fosket & Ceserani, 2007). Dry storage refers to holding of foods above ambient

temperatures. Dry storage is used in the storage of food grains such as maize, beans, flour, and potatoes.

Most disease causing bacteria can grow within a temperature range of 5^0C to 60^0C, commonly referred to as the food "temperature danger zone" (McSwane, Rue & Linton, 2000; Frazier & Westhoff, 1988). It is further recommended that all cold foods must be stored at 5^0C or below and all hot foods held at 63^0C or above. Ghana's law requires that storage of food should be under such conditions as shall prevent contamination, including development of pathogenic or oxygenic microorganisms or both (Ghana's Public Health Act, 2012). To ensure the maintenance of all potentially hazardous food at the required cold temperatures during storage, refrigerators and freezers should be equipped with a numerically scaled thermometer (McSwane, Rue & Linton, 2000). It is also important that these thermometers are tested for accuracy at regular intervals (National Board of Experts-HACCP, The Netherlands, 2002).

2.7.3 Chilling

Chilling is a process that involves cooling food by ice or by mechanical refrigeration as a temporary measure to preserve food until some other preservative process is applied (Frazier & Westhoff, 1988). Frazier and Westhoff further stated that the foods that need to be chilled include eggs, dairy, meats, seafood, vegetables and fruits. The World Health Organization's Ten Golden Rules for Safe Food Preparation states that putting too large a quantity of warm food in the refrigerator is a common error responsible for countless cases of food borne diseases. This result in the center of food remaining warm (above 10^0C) for too long, hence microbes thrive, quickly proliferating to disease causing levels. Food intended to be stored especially for longer periods should be cut/divided into smaller portions, put in plastic freezing bags, and then rapidly frozen.

Separating raw products from ready-to-eat food is important to prevent cross contamination from bacteria such as *Campylobacter*. Ways to separate food include separating fresh produce and raw meat into different grocery bags and wrapping meat in a container or bag to prevent dripping of raw meat's liquid residue on ready-to-eat foods. Most cases of *campylobacteriosis* occurred from cross-contamination or ingestion of raw meat (CDC, 2009). A small dosage of juice from raw meat is sufficient to cause illness from *Campylobacter* (Tauxe, 1992; CDC, 2009). Cleaning any surface or utensils after contact with raw meat or poultry is important to prevent foodborne illnesses outbreak from pathogens such as *Campylobacter jejuni* and *Salmonella spp* (Fein, Jordan Lin, & Levy1995; Hillers, Medeiros, Kendall, Chen, & Dimascola, 2003). Researchers reported that only about two thirds of food handlers clean their cutting board after handling raw meat or poultry (Altekruse, *et al* (1995).

Bekker (2003), noted that dry storage refers to the holding of foodstuff or food at room temperatures (10^0C to 21^0C). The foods stored under these conditions include grains e.g. beans and maize, canned foods, and oils. Separate storage is normally required for the storage of other non-food items such as cleaning equipment, detergents, insecticides and equipment used in preparation, cooking and serving of food. However, if these items are stored in the same store with the food items, separate facilities should be provided and the necessary precautions to prevent contamination should be observed (McSwane, Rue & Linton, 2000).

2.7.4 General Storage Rules

Bekker (2003) and McSwane, Rue and Linton (2000), agreed on the following general rules for storing food.

1. Cooked foods should be kept well separated from raw food and covered to reduce the risk of cross-contamination.

2. Food should be kept off the floor and away from walls.
3. First-in-first-out (FIFO) system of stock rotation should be implemented.
4. Arrangement of items in stores should be well done and coded/marked for ease of identification and removal for use.
5. All foods should be stored in an orderly fashion so as to facilitate ventilation and assessment of food to detect deterioration.
6. Any shelf or display case used for displaying or storing food or any container shall be kept clean and free from dust or any other impurity.

2.7.5 Washing

Poultry, fish, and meat should be washed with lukewarm water followed by a cold rinse shortly before cooking so as to remove every bit of dirt and some microorganisms like Salmonellas. Fruits and vegetables should be thoroughly rinsed with water before eating raw or used for preparing food. Utensils including the cutting board should be washed with soap and warm water between each preparation (Bekker, 2003; Frazier & Westhoff, 1988).

Washing hands prior to handling food is crucial in preventing foodborne illness from pathogens such as *Norovirus* and *Salmonella*. *Norovirus* can be transmitted from touching ready-to-eat food with hands contaminated with the pathogen. The Centers for Disease Control and Prevention (2010) recommended washing hands before, during and after food preparation to prevent the spread of *Norovirus*. Food experts also recommended washing hands after touching a pet and before preparing food to prevent *Salmonellosis* (CDC, 2009). A study reported that only 66 percent washed their hands after handling raw meat or poultry, although 86 percent knew that hand-washing can lower the risk of foodborne illness (Altekruse *et al.*, 1995). Another study indicated that

40 percent of the foodborne illness outbreaks in fresh produce was caused by poor personal hygiene and improper contact with sewerage. Since most middle school children reported that they helped prepare food (Byrd-Bredbenner, Schaffner, & Mauer Abbot, 2010; Haapala & Probart, 2004), hand washing is crucial in preventing food borne illness. A study demonstrated that school children who washed their hands four times daily had 24% fewer absences caused by breathing-related problems and 51% fewer absences caused by stomach cramps, compared to children who did not wash their hands (Master, Longe, & Dickson 1997).

2.7.6 Cooking

Proper cooking of potentially hazardous foods destroys harmful micro-organisms that may be present in the food however, different foods and the methods, by which they are cooked, require different end point temperatures to be safe. The range of safe cooking temperatures can vary from 63^0C to 74^0C (McSwane, Rue, & Linton, 2000) but it is recommended that the core temperature of all parts of the food must reach at least 70^0C within a period of 2 hours (Frazier & Westhoff, 1988). The South Africa (1997), states that the time and temperature of cooking should be sufficient to ensure destruction of non-spore forming pathogenic micro-organisms. However, spores of certain bacteria like *Clostridium botulinum*, *Clostridium perfringens* and *Bacillus cereus* can survive cooking temperatures (Frazier & Westhoff, 1988).

Frozen meat, fish, and poultry must be thoroughly thawed before cooking so as to result in better return of moisture to the cells hence gaining look of original food (Frazier & Westhoff, 1988). They further state that this should be done slowly and be well controlled, reasonably rapid thawing is recommended to prevent the possible growth of micro-organisms.

Inadequate cooking is a common cause of foodborne illness. Food handlers are recommended to avoid eating raw or uncooked eggs to prevent illnesses from *Salmonella enteridities* (Hillers, *et al.*, 2003). Undercooked meat could contain harmful bacteria, such as *Salmonella* spp., *Campylobacter jejuni* and *E.coli* O157:H7 which contribute to foodborne illness outbreaks (Hillers, *et al*., 2003). DeWaal and Robert, (2013) speculated that 43% of beef-associated outbreaks were caused by undercooked meat. One-fourth to three-fourth of all meat and poultry sold in 1999 was contaminated with at least one pathogen (Medeiros, Hillers, Chen, Bergmann, Kendall, & Schroeder, 2004). Hence, it is important to cook food until the proper temperature to kill these pathogens. A study reported that approximately 60 to 70% of food handlers cooked their hamburgers to the proper temperature (Altekruse *et al*., 1995).

2.7.7 Cooling, Reheating, and Holding of Food

Cooling refers to the removal of heat energy (Potter & Hotchkiss, 1998). Proper cooling of food after cooking prevents the conversion of spore forming bacterial cells to vegetative bacterial cells and the growth of vegetative bacterial cells. During cooling, food must be cooled to 21^0C within two hours and from 21^0C to 5^0C within an additional four hours (McSwane, Rue, & Linton, 2000). When dishes containing a mixture of cooked and raw ingredients such as salads are being prepared, it is important to cool the cooked component before mixing with the other ingredients. Spores of certain bacteria like *Clostridium botulinum*, *Clostridium perfringens* and *Bacillus cereus* can survive cooking temperatures therefore, during reheating the food should be reheated to 74^0C within two hours to prevent the numbers of organisms that may have grown during the cooling process from reaching levels that can cause food borne illness (McSwane, *et al.,* 2000).

Holding of food implies keeping or retention of semi-finished or finished food for a period of time under specified temperatures and may be done during cooking, cooling, reheating, and food preparation. During these activities, the amount of time the foods stay in the "temperature danger zones" must be minimized to control microbial growth. The National Board of Experts- HACCP, The Netherlands (2002) and McSwane, Rue and Linton (2000) are of the opinion that foods should be held for a minimal amount of time during preparation in the "temperature danger zone" (5^0C to 60^0C) to control microbial growths and should pass through the danger zone as few times as possible. Hot food should be cooled and reheated only one time, if not used up after first reheat the food should be discarded.

2.7.8 Serving of Food

Food should be handled, served or sold with clean equipment and utensils that is tongs, forks, spoons or disposable gloves and never handled with bare hands. Utensils/cutlery should be clean and dry and not handled by touching the food contact surfaces (McSwane, Rue, & Linton, 2000) and plates filled with food should not be stacked on top of the other during display, storing or serving. Clean tongs, forks, spoons or disposable gloves should be used when handling street – vended foods. Good personal hygiene should always be practiced when serving food, by wearing a clean uniform and hair restraint and wash hands after handling money and before handling food again (National Board of Experts, The Netherlands, 2002).

2.7.9 Managing Waste

According to (FAO/WHO, 2002), humans produce all kinds of refuse when trading. Without care, the refuse can endanger consumer health. It is in fact a major source of contamination of food products and food preparation and vending premises.

Effective measures are therefore needed for the hygiene and sanitation of food preparation and vending sites and raw material and ingredient storage areas to prevent the contamination of food and surroundings. All waste should be handled and removed in such a way as to prevent the contamination of food, water and environment. Special care should be taken to keep insects, rodents, dogs, cats and other animals away from food waste. Contamination of food, water and environment can be avoided by putting waste in waterproof covered bins. Care should be taken that the bins are not allowed to overflow and are emptied daily. To the extent possible, liquid waste, such as wastewater, should be separated from solid waste. Liquid waste (except oils and fats) should drain into a sewer through a device (e.g. filter) that retains any solids present. Fatty waters should be eliminated by appropriate means, such as grease tanks. Solid waste should be placed in closed dustbins that are emptied at least once a day into the municipal refuse skip.

2.8 Regulation of Food Vendors

The regulation of the informal food industry in relation to terms of practice, policy and access to resources is very crucial since the laws applicable to the formal food industry are not suitable to be extended and applied to the informal food industry. However, the laws and regulations governing food safety and quality in authorized and licensed premises (formal food industry) are applied to the informal food industry. Kitagwa *et al.*, 2006) is of the opinion that the laws lack proper direction and guidance for their application in the informal food industry by the implementing agents.

In Ghana the agencies that are involved in the regulating and ensuring the safety of food include the following: Environmental Protection Agency (EPA), the Food and Drug Authority (FDA), the Ghana Standards Authority (GSA), the Ghana Tourist

Board (GTB), Vertinary Services Department (VSD) and the District/Municipal/ Metropolitan Assemblies. In Ghana, the Food and Drugs Law (PNDC Law 305 B) (1992), Amendment Act 523 (1996) and various bye-laws on food hygiene aim at ensuring that only safe and wholesome food, drugs and other substances are made available for public consumption. As stipulated by these laws, the sale of food under unsanitary conditions is an offence.

Kitagwa *et al.* (2006) concluded in a study in Kenya that it is required by both the central government and local authorities that businesses are issued with trade licenses. The process of licensing food vendors involves application followed by carrying out health inspections and issuing of a health certificate, approval, payment of licensing fees and the issuance of license. This is done to improve and maintain food sanitation in the informal food industry. This conclusion is in line with what pertains in Ghana and outlined in the Bye-laws of the New Juaben Municipal Assembly (Sec. 79 of the Local Government Act 1993 (462). The laws require all persons dealing in all kinds of food in whatever form to obtain licenses. The law states that no person shall operate any business within the New Juaben Municipality area of jurisdiction without a license issued by the Assembly (Business Operation Permit; Bye-laws (Sec. 79 of the Local Government Act 1993 (462). The license shall be issued on the recommendation of the Medical Officer of health after an inspection by Health Inspectors. The license states the number, the person to whom it is issued, the premises or location, the duration and the date issued. License must be displayed at the place of sale. All licenses are subject to renewal every six months.

Another common way of regulating street vended food in developing countries is through medical examination of food vendors (WHO, 2006). Medical examination of food handlers, according to FAO/WHO (2010), is necessary if clinically or

epidemiologically indicated. This is to ensure that people with communicable diseases are excluded from food handling. In Ghana, public health requirements insists on food handlers undergoing medical screening for infectious or contagious diseases such as typhoid fever, tuberculosis, cholera, dysentery and other communicable and air-borne diseases before they start to operate. Periodic screening is also a requirement by metropolitan, municipal and district environmental health officers and inspectors. The vendors are expected to carry out complete physical and medical examination and obtain health certificates issued by the authorized health centers and hospitals. The health certificate is to be kept by the vendors, presented on inspection and renewed every six months. No person suffering from an infectious or contagious disease shall be allowed or take part in the preparation of food or allowed to handle fresh meat or fish or be present in the place of sale or storage.

Health certificates must be within easy reach on the premises for ease of inspection by the Councils Health Officers (Bye-laws of the New Juaben Municipality, Sec. 79 of the Local Government Act 1993 (462). However some studies conducted revealed a violation of this law. For instance, findings from studies conducted in Nigeria by Musa and Akande (2003) indicated that only 30 out of 141, representing 21% of food vendors in secondary schools in Ilorin had undergone medical examination and are issued with health certificates. Respondents cited reasons for not having the health certificates as lack of funds, non-awareness and lack of strict enforcements from authorities. This finding is in line with another study carried out in Accra, Ghana by Ackah, Gyamfi, Anim, Osei, Hansen, and Agyemang (2011) in which only 40% of the respondents had acquired a health certificate. A study conducted by Abdalla *et al.* (2009) concluded that routine medical examination of food handlers must be carried out by health officers in the development of strategic plans towards regulating safe

street food handling , preparation, and vending. This regulation is however not in consistent with the assertion made by Abdulssalam and Kaferstein (1993) who argue that medical examination of food vendors prior to licensing, or at intervals after wards, does little towards ensuring food safety and should not be mandatory. That notwithstanding, as a form of precaution, Section 286 of the Criminal Code, (Amendment) Act, 2004 (Act 646) of Ghana in 2004 charges all food vendors to be examined to ensure they do not infect consumers with communicable diseases.

Protective clothing, including coat, head covering, footwear and sometimes trouser and gloves, should be worn by food handlers who cook and sell food. They should also be kept clean and neat always (Ghana Public Health Act, 2012). Hanoshiro, Morita, Matte, Matte and Torres (2004) in a study in Brazil pointed out that only 5.5% and 8% of street food vendors respectively wore caps and aprons. In another study conducted in Bloemfontein in 2006, 71% of street food vendors observed wore head coverings during food preparation (Lues, Rasephei, Mpeli & Thereon (2006). These figures were very discouraging and showed a high health risk as was revealed in another study by Adjrah, *et al.,* (2013) that, poor hygiene practices, particularly deficient of aprons and caps wearing could be the causative factor of contamination of the analyzed samples. However, Campbell (2011) in a study in Johannesberg revealed that 90% wore aprons and 83% wore head coverings. Some food vendors do not keep the aprons and hair coverings clean. A study by Paulson (1994) revealed that (46.6%) vendors were moderately clean and clothes of (13.4%) vendors were dirty.

2.9 Role of the Environmental Health Officer

The Environmental Health Officer uses the knowledge and skills of the natural, behavioural and environmental sciences to prevent diseases and injury and to promote

human well-being in terms of food control. Environmental Health Officers have powers to enter any food premise at any reasonable time in order to conduct the following food control duties (Ghana Public Health Act, 2012).

1. Inspection of food premises and food.
2. Sampling of food.
3. Seizure and condemnation of food which in his/her opinion is not of the nature and substances demanded by the consumer and detain as long as is necessary.
4. Review building plans.
5. Provide health education.
6. Air pollution control due to open fires and other emissions.
7. Control of food borne disease outbreaks.
8. Insect and rodent control.
9. Enforce environmental and public health laws and prosecute those who contravene the laws.

2.10 Consumers of Street Foods

The street/informal food consumers come from all levels of society with respect to age, gender, social and income status. Many people are patronizing street foods since it plays an important role in helping them to meet their energy and nutrient needs. Consumers in urban areas spend less time to prepare food and pay up to 30% more for food compared to their rural counterparts (Tortoe, Johnson, Ottah-Atikpo & Tomlins, 2013). In Accra for instance, 40% and 25% of the household budget is spent on street foods by low and high income groups respectively (Maxwell, 2000). The report further indicated that children especially school children purchased and consumed a high proportion of street/informal foods.

People of all age groups consume street foods in Africa and other parts of the world however, there may be differences in the type of clientele depending on locality. While it is often thought that children under five years are fed from home, Mensah *et al.* (2002) observed that many mothers working at the markets in Accra also bought some food from vendors to feed their babies. The customer surveys undertaken by FAO (2006) also revealed that the main consumers of street foods in most countries were other members of the informal sector, such as fellow hawkers and hustlers and casual wage laborers. Other important categories of customers were children and students, office workers, and housewives. The studies also found that street foods were consumed across all income groups and the proportion of the daily household food budget spent on street foods was high, ranging from (25%) in Bogor to (47%) in Chonburi, Thailand. Other studies found that most of the consumers of street foods were from the low or middle income group (Mensah *et al*. 2002).

The majority of consumers of street foods in West Africa were however found to be male (Umoh & Odoba, 1999). Ntiforo (2001) noted in a study conducted in Ghana that the age range of consumers of vended foods ranged from 10 to 60 years. Studies conducted in India, Indonesia and Nigeria revealed that the range of the ages of street food consumers was 10 through 40 years. A different result was also realized from studies conducted in Ghana with an age range from 23 to 48 (MacArthur, 2007).

Other studies revealed that street foods are reported to play a considerable role in the daily diet of low-income male urban workers in Nairobi (Sujatha, Shatrugha, Rao, Reddy, Padmavathi & Vidyasagar, 1997) and Calcutta street traders (Chakravarty & Canet, 1996). A significant number are professionals and represent the diverse ethnic groups in the countries concerned. The consumers also include the illiterate as well as people who have achieved a variety of educational levels.

The street foods have been shown to contribute a substantial proportion of the daily requirement of energy and protein (25%-50%) for adolescents attending schools (Oguntona & Kanye, 1995) and urban market women (Oguntona & Tella, 1999). In Nigeria the nutritional value however depends on the ingredients used and how they are prepared, stored and sold (Owusu-Darko & Ablordey, 2002). Most consumers are unable to protect themselves from possible health hazards since they are not well informed about food safety. Some studies revealed that the people who depended on street foods were often more interested in its convenience than its safety, quality and hygiene (Mensah *et al*. 2002; Muinde & Kuria, 2005). A study conducted by Opare - Obisaw (1990) in Accra Ghana revealed that consumers were aware of the unhygienic conditions of street food and its subsequent health dangers but ignored these dangers and continued to patronize these foods due to time constraints affordable prices and proximity to the place of work or institutions.

2.11 Summary of Literature Review

Literature reviewed in this study discussed the food handling practices of street food vendors in Koforidua and the perceptions of their consumers. The review discussed the Hazard Analysis Critical Control Point (HACCP) Model and the Compliance Process Model. Whiles the HACCP model considers only food handlers as being responsible for the safety of food the Compliance Process Model incorporates the enforcement agencies. Other areas discussed included food contamination, food borne diseases, regulation of food vendors, disposal of waste, consumers of street vended foods among others.

The literature review revealed that a number of researches have been conducted in the area of food handling practices of street food vendors in other parts of the world and in Ghana. It was revealed that food safety has become a very important issue of

public concern due to its direct relationship with the health of individuals. However much has not been done in Koforidua. Again most of the studies conducted in Ghana here were done on only the food vendors but not the consumers.

CHAPTER THREE

METHODOLOGY

3.0. Introduction

This chapter describes the methodology adopted in the study. It outlines the research design, population, sample and sampling procedures, data collection procedures, research instruments and data analysis.

3. 1. The Study Area

Koforidua is the capital of the Eastern Region of Ghana and it lies in the New Juaben Municipality. In recent times Koforidua has been experiencing a rapid population growth. According to the Statistical Service the population of Koforidua in the 2000 census was 87,315.This rapid growth rate can be attributed to a number of factors which include: Natural population increase and migration of people to the regional capital (Ghana Statistical Service, 2000). This implies that majority of the people both young and old come to Koforidua for various reasons; for instance to seek employment opportunities, medical care, education, visit places of interest, trade and also do some shopping. Due to the above reasons and the period they spend in the capital, such people require a variety of fresh low cost foods to eat. This is due to the fact that, street food and most especially chop bars provide a variety of foods and have become popular and has therefore led to their rapid growth.

Furthermore, the informal food sector is increasingly becoming social joints for patrons especially during lunch time and evenings and at the same time offer employment to the disadvantaged. Most vending sites lack basic sanitary facilities like toilets, hand wash basins, supply of pipe borne water and waste disposal systems. The nature of their structures make maintenance and cleaning difficult and therefore form

good breeding sites for disease vectors like flies, rats and cockroaches. All these may result in the contamination of foods (McSwane, Rue & Linton, 2000). Among the foods prepared and sold by the food vendors are; "fufu"," banku", "akpele" " omotuo" (rice balls), "kokonte", "gari" and beans among others all of which are served with various types of soup and stew.

3.2. Research Design

The research design for the study was a descriptive survey. Descriptive survey research involves the collection of data in order to answer research questions concerning current state of affairs of the subject under investigation. Descriptive survey research thus determines and reveals the way things are and is directed towards the determination of the nature of a situation as it exists at the time of the study. Hence, the use of the descriptive survey is justified since the study sought to find and analyze a current food handling situation in the informal food industry in Oguaa Koforidua Central in the New Juaben Municipality of the Eastern Region of Ghana. According to Neumann (2007), survey research asks respondents about their beliefs, opinions, characteristics and past and present behavior. Fraenkel and Wallen (2000) also explained that obtaining information from a large group of people by setting carefully worded questions and carefully administered questionnaire is what lies in the heart of a descriptive survey.

This design was chosen because it has the merit of gathering various responses from a wide range of people. It also enables one to have a clear picture of events and people's behaviour on the basis of the data gathered for a particular period of time. Again, in depth follow-up questions can be asked and items that were not clear could be explained using a descriptive survey design. Furthermore, a descriptive survey helps to present the true state of affairs of a given situation after data have been collected

from a number of people who respond to the same set of questions about a given situation.

However, there is the problem of ensuring that the questions to be responded to using the descriptive survey design are clear and not misleading because the results obtained could depend on the wording of the questions. Such questions can produce unreliable results if they inquired into private matters, people would not easily cooperate. These limitations notwithstanding, the researcher believed that the research design was the most appropriate design which could help make direct contact with the street food vendors and enable the researcher to draw useful and meaningful conclusions from the study.

3.3. Population

The population of the study included all food vendors selling cooked food in Koforidua in the New Juaben Municipality. The study required data on the food handling practices of the food vendors from the time of preparation to the point of sale. The target population was the food vendors who cook and sell food on site and the consumers of the vended foods.

3.4. Sample and Sampling Technique

According to Kumar (2005), sampling is the process of selecting a few subjects from a population to become the basis for estimating or predicting a fact, situation or outcome regarding the group. Although the study was interested in street food vendors, the sample frame for the study was the food vendors who cooked and sold food on the spot for sale. They included both trained and untrained, licensed and unlicensed food vendors and the consumers of the vended food in Oguaa, the central point of Koforidua where most formal and informal businesses are located.

3.4.1 Selection of Vendors

The purposive sampling was used to select both the trained and untrained food vendors. The purposive sampling technique is the type of technique the researcher purposively chooses the subjects who in his or her opinion are relevant to the research topic (Creswell, 2007). Homogeneous purposive sampling technique was used which aimed to achieve a homogeneous sample whose units (e.g., people, cases, etc.) share the same or very similar characteristics or traits such as age, gender, background, occupation, etc. The researcher chose the subjects to make easy comparison of their food handling practices. Fifteen (15) stationary food vending sites made up of ten (10) licensed and five (5) unlicensed food vendors were purposively chosen for the study. Fifty (50) food vendors were then purposively selected from the chosen vending sites made up of three (3) food vendors from each of the ten (10) licensed vending sites and 4(four) food vendors from each of the five (5) unlicensed vending sites.

3.4.2 Selection of Consumers

The study was also intended to find out consumers of vended foods knowledge of food borne diseases and food safety. This was necessary because some studies revealed that the knowledge of consumers on food borne diseases is very low (Kitagwa *et al.,* 2006; Sanlier, Da deviren, Çelik, Bilici & Abubakirova, 2011) and these had to be ascertained. Hence one hundred (100) consumers were selected. They constituted 70 consumers from the licensed food vendors and 30 consumers from the unlicensed food vendors. The convenience sampling technique was also used. The convenience sampling is a technique in which a sample is drawn from the population that is readily on hand, or convenient. According to Bhattacherjee (2012), an example of convenient sampling is where a researcher stands outside a shopping center and hands out survey

questionnaire to people or interview them as they walk in. In all, a sample of 150 respondents made up of fifty (50) food vendors and one hundred (100) consumers were sampled for the study.

3.5. Research Instruments

The research instruments used to gather data for the study were observation checklist, structured interview guide and questionnaire. Observation is a method of data collection that employs vision as the main means of data collection. The structured observation guide used employs formal and strictly organized procedure with a set of well-defined observation categories. Observation offers the researcher the opportunity to obtain first-hand information on participants with or without their knowledge. The observation was conducted using an observation checklist designed by the researcher. Critical attributes in safe food handling were used to assess the practices of the food handlers, availability of equipment and tools, and the sanitation of the environment from where the food is prepared among others. A check of "Yes" or "No" was made against all the attributes observed. Direct observation was used during the data collection session. The street food vendors were given prior information that they would be observed. The researcher also applied a time allocation to the method of data collection. A time allocation involves the researcher selecting a time to conduct an observation and recording what the participants were doing when participants were first seen and before participants realized the researcher was watching (Brown, 2010). The purpose of developing the study with the elements of a direct observation coupled with time allocation was that even though the participants were aware they were being watched, time allocation assisted in alleviating the participants' knowledge of when the researcher would be watching their actions. The disadvantages of conducting an

observational study are reactivity and observation bias. Reactivity is the influence that an observer has on the behavior under observation even though the behavior influenced by an observer may not be representative of the behavior when an observer is not present (Shaughnessy, Zechmeister & Zechmeister, 2002). Sample of the observation checklist can be found in Appendix A.

A structured interview is a data collection procedure in which the interviewer asks the respondent oral questions and demand oral answers (Babbie, 2001). A structured interview is in reality a questionnaire read by the interviewer as prescribed by the researcher (Ary, Jacobs, Razavieh & Sorensen, 2006). The interview guide was made up of both close ended and open ended questions. According to Neumann (2007), open ended questions are unstructured to which respondents give any answer to enable researchers learn how a respondents thinks to discover what is actually important to him or her or an answer to a question with many possible answers. Close ended questions on the other hand are structured and responses are fixed and allows for easy coding. Close ended questions are known to provide control over the participant's range of responses by providing specific response alternatives (Borden & Abbott, 2002). This makes it easier to summarize and analyze the responses. The interview guide consisted of 45 questions made up of both open and close ended questions and sub divided into sections. Section A was made up of the demographic data of the food vendors, Section B was on food vendors knowledge on food borne diseases and regulations governing their operations, Section C was basically on food handling practices of the respondents, and Section D was on the training facilities available for the food vendors. Interview was used for this study because some of the respondents (food vendors) could not read or write. A copy of the interview guide is attached as Appendix B.

Questionnaire was meant for the literate consumers of vended foods. The questionnaire has both open ended and close ended questions. The questionnaires consisted of Section A, which was made up of demographic information of the respondents such as age, sex, occupational status, religious affiliation and marital status and Section B was on the consumers' knowledge and perceptions on food borne diseases and the safety of foods. The reason for using the questionnaire as an instrument of data collection was based on the fact that it provided a wider coverage of the sample and also facilitated the collection of large amount of data (Neumann, 2007). Sample of the questionnaire is attached as Appendix C.

3.6. Validity and Reliability

Validity is defined as the extent to which an instrument measures what it intended to measure (Ary, Jacobs, Razavieh, & Sorensen, 2006). Reliability on the other hand is the degree of accuracy or precision in the measurement made by a research instrument (Kumar, 2005). To ensure the validity of the instruments, the structured interview guide, questionnaire and the observation checklist were submitted to the research supervisor for in-depth scrutiny. Again six copies each of questionnaire, interview guide, and observation checklist were pre-tested on stationary food vendors who had similar characteristics as those sampled for the main study. The people used for the pilot study were also stationary food vendors at different locations in Koforidua but were not part of the sample for the study. This enabled the researcher to do away with any ambiguity that may crop up and also to verify the clarity and understanding of respondents of the data collection instruments to determine the amount of time required to complete the data collection. Through the responses from the pilot study, the researcher saw the need to use research assistants to help with the observation of the

food vendors to prevent any bias that might occur during the actual study. The pilot study also helped the researcher verify clarity, understanding of interview questions by respondents and to determine the amount of time required to complete the interview. The researcher further used Triangulation which allowed the researcher to compare results obtained from the different methods used for then data collection (Mays & Pope, 2000).

3.7. Data Collection Procedure

The nature of the data was both qualitative and quantitative utilizing observation, questionnaire and structured interview to gather the data needed for the study. The researcher conducted the observations in the kitchen, the washing up areas, the sale and service point as well as the immediate surroundings of the stationary vendors and spent a maximum of two hours on each observation session. The data was recorded on an observation checklist which was developed by the researcher based on handling practices of the food vendors and the availability of equipment and other facilities. Face to face interviews were also conducted utilizing a structured interview guide. Interviews were conducted in the local dialect (Twi) by the researcher. The structured interview guide had fifty two (52) questions based on knowledge, practices, training facilities, and environmental health control of street food vendors. Thus, the researcher used observation and structured interview to gather data from the street food vendors. The questionnaire for the consumers was divided into two sections comprising of twenty two (22) questions. Data collected included demographic data and general information on consumers' knowledge and perception of food borne diseases and the safety of food.

3.8. Ethical Considerations

Creswell (2005) contends that it is important to respect the site where research takes place. This respect according to Creswell is shown by obtaining permission before entering the site. A formal letter was therefore sent to the New Juaben Municipal Assembly, Koforidua to obtain permission from the authorities prior to the commencement of the research. This was facilitated by an introductory letter obtained from the Department of Home Economics Education, University of Education, Winneba. The letter detailed the purpose of the study and why the site was chosen. Potential participants were duly informed that their participation was voluntary and they were free to abstain or even withdraw from the study whenever they liked. Ethics in research refers to considerations taken to protect and respect the rights and welfare of participants and other parties associated with the research activity. Anonymity and privacy of participants were guaranteed by asking them not to write their names when filling the questionnaires. Again, participants were verbally assured of the confidentiality in the handling of any data they provided and that the data obtained from them would be used solely for the purpose of the research.

3.9. Data Analysis Plan

The researcher checked, edited, coded, and processed the data gathered using the Statistical Package for Social Sciences (SPSS) version 17. Responses were gathered by using the observation checklist and structured interview guide were summarized, categorized, and coded before the SPSS was used to analyze the data. With regards to the qualitative data gathered, they were analyzed manually by making summaries of the views of the respondents and supporting those views with quotations that spelt out the views of the respondents. Hypotheses were also tested using the Pearson correlation.

3.10. Summary

This chapter described the research methodology, materials and methods used to gather relevant data for the study. It also described how research instruments were distributed and how data was analyzed.

CHAPTER FOUR

RESULTS

4.0. Overview

This chapter describes the findings of the study. It presents the results and the analysis of both quantitative and qualitative data generated from the interview guide, observation checklist and questionnaire.

FOOD VENDORS

4.1 Demographic Characteristics of the Informal Food Vendors

Sixty percent (60%) of food vendors sampled for the study came from Koforidua while the remaining forty percent (40%) had their hometown outside Koforidua. This indicates that there are more indigenes in the food business in Koforidua. On account of gender, 8 of the respondents representing (16%) were males whiles 42 respondents representing (84%) were females.

Table 4.1: Age Distribution of Food Vendors

Age	Frequency	Percentage
20-24	4	8
25-29	6	12
30-34	10	20
35-39	12	24
40 and above	18	36
Total	**50**	**100**

The dominant age group of the respondents were above 40 years thus (36%) followed by 35-39 year group (24%), 30-34 year group (20%), 25- 29 year group (12%), and 20- 24 year group (8%). This shows that the majority of the food vendors are above

age thirty suggesting that they are more focused on the food vending business as compared to those within the range of age 20-30

Table 4.2: Vendors Educational Level

Educational level	Frequency	Percentage
No Education	22	44
Basic Education	14	28
Secondary Education	12	24
Tertiary Education	2	4
Total	**50**	**100**

With regards to the level of education of the respondents, (44%) were illiterates, (28%) had received basic education, (24%) had received secondary education, and a minority of 4% had also received tertiary education as shown in Table 4.2. This reveals that a good number of street food handlers in Koforidua are illiterates.

The languages spoken by the vendors were Akan and English. Vendors who spoke English and Akan were 52% and 48% spoke Akan only. On account of food vendors who could read and write, 46% could read and write whiles 54% admitted they could not read or write.

Table 4.3: Religion of Food Vendors

Religion	Frequency	Percentage
Christian	26	52
Muslim	14	28
Traditional	10	20
Total	**50**	**100**

As shown in Table 3, with regard to the religious affiliation of the food vendors, (52%) were Christians, (28%) were Muslims whilst (20%) were traditionalist.

Table 4.4: Vendors Years in Business

Years	Frequency	Percentage
Less than one year	2	4
1-2 years	12	24
3-5 years	20	40
6-10	12	24
Above 10 years	4	8
Total	**50**	**100**

As represented in Table 4.4 (40%) of the respondents have been in business for 3-5 years, (24%) of the respondents have been in business for 6-10 years, (24%) of the respondents have been in business for 1-2 years, (8%) of the respondents have been in business for more than ten years and the remaining (4%) of the respondents have been in business for less than a years.

Table 4.5: Vendors' Reasons for being in Business

Reasons	Frequency	Percentage
Unemployment	38	76
Business opportunity	7	14
Other	5	10
Total	**50**	**100**

From Table 4.5 (76%) of the respondents stated unemployment as reason for being in business, (14%) stated it served as a business opportunity, while and (10%) stated it was a family business. Results also indicated that all the food vendors used for the study cooked and sold food on site.

CONSUMERS

4.2 Demographic Characteristics of Consumers

Ninety six percent (96%) of the consumers lived in Koforidua whiles the remaining (4%) were not residents in Koforidua. Sixty four percent (64%) of the consumers were males with thirty six (36%) being females.

Table 4.6: Age Distribution of Consumers

Age	Frequency	Percentage
Below 20 years	10	10
21-30 years	42	42
31-40 years	32	32
Above 40 years	16	16
Total	**100**	**100**

With regard to the age distribution of the consumers, Table 4.6 shows that, 10% of them were below 20 years of age, 42% were within the age range of 21-30, 32% were between the age range of 31- 40 and the remaining (16%) were above 40 years.

Table 4.7: Educational Level of Consumers

Educational level	Frequency	Percentage
Basic Education	14	14
Secondary Education	38	38
Tertiary Education	48	48
Total	**100**	**100**

On consumers educational background, 14% had received basic education, 38% attended secondary school while 48% were degree holders. Eighty one percent (81%) of the consumers were in employment while 19% were unemployed.

4.3 Research Question One:

What awareness do food vendors in Koforidua have on food borne diseases, and the regulations governing their operations?

People who work outside the home or travel are always compelled to patronize food sold by food vendors all over the country. There is however the challenge that most of these vended foods may be contaminated and as such their consumption may lead to food borne diseases. This research question therefore sought to determine the food vendors' knowledge of food borne diseases and the regulations that govern their operations in the area under study. The researcher wanted to find out the food vendors knowledge of food handling practices that lead to food contamination and subsequently to food borne diseases. In addition, the researcher wanted to find out if the respondents were aware of the food vending regulations that guide them in their operations.

Table 4.8: Food Vendors knowledge of Food Borne Diseases and Food Vending Regulations

Item	Yes		No		Total	
	f	%	f	%	f	%
Are there laws and regulation governing food vendors?	50	100	0	0	50	100
Are you aware of any food safety regulations?	35	70	15	30	50	100
Do you have certificate of acceptability to handle food?	30	60	20	40	50	100
Do you know why you need certificate of acceptability to handle food?	24	48	26	52	50	100
Do you know who the environmental officer is?	36	72	14	28	50	100
Do you wash your hand frequently when handling food?	50	100	0	0	50	100
Keeping work surfaces clean reduces risk of food borne illness	44	88	6	12	50	100
Storing raw and cooked food separately in the refrigerator help to prevent food borne illness	8	16	4	8	50	100
Do you check on the temperature of food before storage?	12	24	38	76	50	100
Do you cover cooked food properly?	50	100	0	0	0	0
Improper waste disposal can lead to food contamination	40	80	10	20	0	0
Cooked food should be thoroughly reheated	50	100	0	0	0	0
Do you separate equipment and utensils for handling raw and cooked food	6	12	44	88	0	0
There should be portable water at vending sites	50	100	0	0	0	0
Do you cover cooked food properly?	50	100	0	0	0	0

Key: D.K = Don't Know

All of the 50 (100%) vendors said they were aware of laws and regulations that governed their practices. Seventy percent (70%) of the vendors were also aware of some of the regulations that guide their operations, whiles the remaining 30% had no knowledge of any food safety regulations. Again, sixty percent 60% of the food vendors had certificates which allowed them to handle food. On the other hand the remaining (40%) did not have certificate of acceptability. On the reason why vendors needed certificates of acceptability, while 44% knew why certificates of acceptability were necessary before operating, 56% had no idea. Majority of the vendors 72% knew the existence of environmental health officers while the remaining (28%) were not aware.

On frequent washing of hands, all the 50 (100%) vendors stated they were aware of the regulations. Twenty four percent 24% of the of the vendors washed their hands before handling food, 52% washed their hands after blowing the nose, 4% washed their hands after greeting people and the remaining 20% washed their hands after visiting the toilet. Eighty eight percent 88% were aware of clean surfaces reduce the risk of food borne diseases whereas 12% were not aware of this.

Only 16% of the food vendors were aware that separating raw and cooked food prevented food borne illness while 8% were not aware of this.76% said they did not know**.** On checking temperature of food before storage, 24% reported they checked the temperature of food before storage, but the remaining 76% did not check the temperature of food before storage.

All 50 vendors (100%) said they always covered their cooked food properly. Eighty percent 80% also knew that if waste was not disposed of properly it could lead to food contamination while 20% answered no to this question. The vendors also knew that cooked food should be thoroughly reheated. Twelve 12% knew the use of separate equipment and utensils for handling raw and cooked food, while the remaining 88%)

were not aware there should be separate equipment and utensils for handling raw and cooked food. Table 4.8: above also indicates that the vendors 100% knew there should be potable water at the vending sites to prevent food contamination.

Seventy two percent (72%) of the vendors reported that they wore aprons and hair covers for identification while 28% wore them for protection. The researcher wanted to examine the vendor's knowledge on the temperature at which cooked food should be sold. Only four percent (4%) sold cooked food when it was very hot and the remaining vendors (96%) sold cooked food when it was just hot.

4.4 Research Question Two:

What are the current food handling practices of informal food vendors in Koforidua?

The researcher used the structured interview guide to find out food handling practices that food vendors engaged in with the following responses. Ninety six percent (96%) of the vendors indicated they underwent medical checkup while 4% did not go for medical checkup before starting operations. On frequency of checkups 8% reported they went for medical checkup every three months and 4% went go every six months while 84% had indicated checkup once every year and the remaining 4% were not sure how often they had medical checkups. With regards to the source of water used at the vending sites, 96% said they used pipe borne water whereas the remaining 4% used water from bore hole.

Table 4.9: Storage of Perishable Food

Where food is kept before preparation	Frequency	Percentage
In cupboards	22	44.0
On shelves	6	12.0
In baskets	6	12.0
Fridge	16	32.0
Total	**50**	**100**

For the storage of ingredients before preparation, majority of the food vendors forty four (44%) kept ingredients in cupboards, 12% kept the ingredients on shelves, 12% kept the ingredients in baskets and 32% in refrigerators. The study revealed that 96% of the vendors inspected food for freshness while 4% did not inspect the food for freshness before buying.

Table 4.10: Storage of Cooked Food

How food is kept after cooking	Frequency	Percentage
In sauce pans	8	16.0
In pots	40	80.0
In warmers	2	4.0
Total	**50**	**100**

On how foods were kept after cooking, 16% kept the food in saucepans, 80% in pots whiles the remaining 4% kept their food in warmers. Only 8% of the vendors used warm water to wash dishes while the remaining 92% washed dishes with cold water and soap. While 36% of the vendors wore aprons and hair coverings 64% did not use aprons at all when handling food.

Table 4.11: Number of Times Aprons was washed

How often are uniforms washed	Frequency	Percentage
Once a week	32	64.0
Twice a week	6	12.0
When it is dirty	4	8.0
No response	8	16.0
Total	**50**	**100**

Concerning washing of aprons, 64% of the food vendors washed their aprons once a week, 12% washed twice a week, 8% washed when they were quite dirty while 8% did not respond at all. All the food vendors put portions of the food in the palm to taste while cooking and hands were not washed after tasting food. All the vendors used municipal collection points to dispose of solid waste. Again, all the vendors washed their dishes with soap and cold water.

Table 4.12: Methods Used to Wash Hands

Methods	Frequency	Percentage
Cold water and dry with uniform	8	16
Cold water with soap and dry with towel	40	80
Hot water and dry with uniform	0	00
Hot water with soap and dry with towel	2	04
Hot water soap and dry with uniform	0	00
Hot water soap and shake	0	00
Cold water and shake	0	00
Total	**50**	**100**

It was revealed that 16% of the food vendors washed their hands with cold water, soap and dried their hands with their uniforms, while 80% washed their hands

with cold water and soap and dried the hands with towel. A small percentage (4%) washed their hands with hot water and soap and dried with towel. Eighty eight percent (88%) of the food vendors did not provide warm water to consumers to wash their hands while only 12% did so. Only 24% of the vendors had toilet facilities at their vending sites. Seventy six percent (76%) had no toilet facilities. Of those who did not have toilet facilities at their vending sites 56% reported they used the public toilets in the neighbourhood while 20% said they go to nearby houses to help themselves and 4% did not respond.

Table 4.13: Alternative Toilet Facilities

Where do you help yourself	Frequency	Percentage
Public toilet	28	56
Nearby house	10	20
No response	12	24
Total	**50**	**100**

In the absence of toilet facilities at the vending sites alternative facilities are listed in Table 4.13. In the absence of toilet facilities at the vending sites, vendors (56%) resorted to public toilet, (20%) went to nearby houses. Twenty four percent (24%) did not respond. The researcher observed the informal food vendors at the various vending sites using an observation checklist. This was done to ascertain whether their food handling practices reported in the interview responses were in consonance with their actual food handling practices right from the period of preparation to the point of sale.

Table 4.14: Summary of Observation of Food Vending Sites

Item	Yes		No	
	f	%	f	%
Food vendors used a container with a cover for storing water	32	64	18	36
Food vendors used washing powder/liquid soap to wash dishes	44	88	6	12
Food vendors used waste bins with cover	14	28	36	72
Food vendor wore apron and hair covering	14	28	36	72
Food vendors used plastic table cloth	28	56	22	44
Food vendors used cooking pots with lids	36	72	14	28
Food vendors used clean hand drying towels	32	64	18	36
Food vendors kept clean environment	28	56	22	44
Food vendors observed proper solid and liquid waste disposal	12	24	38	76
Food vendors washed their hands under running water	14	28	36	72
Food vendors observed correct ways of tasting food	6	12	44	88
Food vendors used easy to clean work surfaces	22	44	28	56
Food vendors washed utensils in warm and cold water	0	00	50	100
Food vendors provided customer with warm water for hand washing	0	00	50	100
Food vendors stored food properly after cooking	20	40	30	60
Food vendors checked for the correct temperature of food	40	80	10	20
Food vendors ensured the availability of portable water at the food vending sites	44	84	6	12
Food vendors used separate equipment and work surfaces for raw meat and cooked food	14	28	36	72
Food vendors kept work surfaces clean	18	36	32	64
Food vendors washed their hands frequently	22	44	28	56
Food vendors used utensils for serving food	48	96	2	4
Food vendors checked for equipment and tools that are rusted	50	100	0	0
Food vendors discarded water for washing utensils frequently	10	20	40	80

From Table 4.14, it was observed that 64% of the respondents used containers with covers to store water used in food preparation. The remaining 36% had containers but without covers which exposed the water to contaminants. Majority of the vendors 88% used washing powder or liquid soap while 12% used cake soap.

Furthermore, 80% were in possession of covered dustbins had registered with the Zoom Lion Ghana Limited. However, 20% had dustbins but without covers. It was observed 28% of the vendors wore aprons during preparation and sale of food with

remaining 72% did not wearing any aprons. The vendors, (56%) used plastic table cloth but (44%) did not use plastic table cloth. Of the 50 food vendors used for the study, (60%) covered their cooking pots with fitting lids when preparing food whereas 20(40%) did not cover the cooking pots when cooking.

On account of the availability of hand drying towels, 64% of the vendors provided clean hand drying towels but 36% provided towels that were not sufficiently clean. Fifty six percent (56%) of the vendors kept clean environment with 44% them the environmental cleanliness was not up to the researcher's expectation. The researcher observed how both solid and liquid wastes were disposed of at the vending sites. Twenty four percent (24%) of the vendors disposed of waste properly with 76% not disposing theirs properly.

With regard to washing of hands, only 28% of the vendors provided facilities that enabled both vendors and consumers to wash their hands under running water. It was observed that only 12% of the vendors tasted food the right way with 88% not tasting food properly. Forty four percent (44%) of the food vendors use easy cleanable working surfaces while 56% did not use easy cleanable surfaces in their operations. It was observed that, none of the vendors used unwashed utensils in their food preparation. The same was observed with the provision of hot water hot water was not provided to consumers, to wash their hands before eating.

A majority of food vendors 40% stored cooked food properly but as high as 60% did otherwise. It was also observed that 80% sold cooked food while it was still hot and the remaining 20% sold food that was not hot. Eighty eight percent (88%) of the food vendors used potable water but 6 (12%) did not have access to potable water in their operations. Furthermore, only 28% of the vendors used separate equipment and work surfaces for both raw and cooked food with 72% of them using the same

equipment and surfaces for both raw and cooked food. Only 36% of the food vendors kept work surfaces clean while 64% did not keep work surfaces clean. With regard to frequent hand washing by food vendors during food preparation and service, 44% of the vendors washed their hands frequently while 56% did not. Again, Table 4.15 revealed that almost all the vendors 96% used appropriate utensils when serving cooked food. None of the respondents used equipment and tools that were chipped or rusted. However, with regards to frequent discarding of water for washing utensils, only 20% of the vendors discarded their water often with 80% using the water over and over again before discarding them.

4.5 Research Question Three:

What training in food hygiene has been given to street food vendors?

This research question was designed to identify the training facilities that are available for the informal food sector by the municipal assembly health officers on food hygiene. All the food vendors (100%) know that they required training to enable them carry out their operations effectively and efficiently. Yet only 60% had been trained and were licensed.

Table 4.15: Training Period

Training period	Frequency	Percentage
1-3 days	24	48
One week	4	8
One month	2	4
No training	20	40
Total	**100**	**100**

With regards to the period of training, 48% stated they were trained for 1-3 days while 8% said they were trained for up to one week. 4% said they were trained for a

period of one month and forty percent (40%) of the vendors stated they had never had any training.

Table 4.16: Reasons for Not Having Training

Reasons for not Being Trained	Frequency	Percentage
Not having money	4	8
Time constraint	16	32
Already trained	30	60
Total	**50**	**100**

The reason why some of the vendors had not received any training were: no money (8%), time constraint (32%) since the training periods always coincides with their busy periods. The remaining 60% were trained and as such gave no response to this question.

Table 4.17: Where Vendors were Trained

Where did you Train	Frequency	Percentage
Workshop	30	60
On the Job	0	0
Not trained	20	40
Total	**50**	**100**

On the account of where the vendors had their training, 60% stated that they trained at workshops with none trained on the job. The remaining 20(40%) were not trained. The researcher probed further to find out from the respondents who organized the training sessions for them. All the 30 (60%) trained vendors were trained by municipal health officers mandated. Forty percent (40%) were not trained.

Table 4.18: Frequency for Organizing Training Sessions

How often	Frequency	Percentage
Once every	0	0
Six months	26	52
Once every year	4	8
Not trained	20	40
Total	**50**	**100**

On when the training programmes are organized for them, majority of the vendors 52%) said they were given training once every six months while 8% stated they were trained once in a year. The remaining 40% respondents were not trained and so could not respond to this question.

Table 4.19: Curriculum of the Training Sessions

Training offered	Frequency	Percentage
Hygienic food handling	8	16
Food and environmental Hygiene	22	44
Not trained	20	40
Total	**50**	**100**

The training given to the food vendors covered hygienic food handling (16%), food and environmental hygiene (44%). The remaining (40%) untrained food vendors could not respond to this question since they were trained. Seventy two percent (72%) of the food vendors stated that environmental health officers visited and inspected their vending sites regularly to make sure they adhered to the rules and regulations that governed their operations. The remaining 28% indicated no such visits.

4.6 Research Question Four:

How may the awareness of consumers in Koforidua on food hygiene and food borne diseases be assessed?

The researcher administered questionnaires to consumers to find out their knowledge and perceptions of food hygiene and food borne diseases.

Table 4.20: Regular Patronage of Vending Sites

Regular Patronage	Frequency	Percentage
Yes	98	98
No	2	2
Total	**100**	**100**

As indicated in Table 4. 20, Ninety eight percent (98%) of the consumers ate their food at the vending sites with only (2%) not eating from the vending sites.

Table 4.21: Low Affordable Prices Attract Consumers to Vending Sites

Affordable Prices of Food	Frequency	Percentage
Yes	82	82
No	18	18
Total	**100**	**100**

According to Table 4.21, among the consumers who ate from the vending sites 82% indicated they were attracted by the low and affordable prices of food sold by the vendors. The remaining 18% did not agree with the majority.

Table 4.22: Food at Vending Site is of Good Quality

Food is Good Quality	Frequency	Percentage
Yes	90	90
No	10	10
Total	**100**	**100**

As shown in Table 4.22, Ninety percent (90%) of the consumers thought the quality of the food they served was okay. Only 10% of the consumers did not think the quality of the food served was okay.

Table 4.23: In which Ways are the Food of Good Quality

Quality	Frequency	Percentage
Tasty	26	26
Filling	28	28
Nutritious	22	22
Enough	14	14
Not Nutritious	10	10
Total	**100**	**100**

Reasons advanced for accepting the food were: tasty (26%), filling (28%), nutritious (22%) and (14%) said the food was enough in quantity. The remaining (10%) of the consumers held the opinion that food sold at vending sites were not nutritious as shown in Table 4.23.

Table 4.24: Hygienic Conditions under which Food is Prepared

Unhygienic Conditions	Frequency	Percentage
Yes	66	66
No	28	28
Not sure	6	6
Total	**100**	**100**

In Table 4.24, the opinion of the consumers on the conditions under which food was prepared at the vending sites, 66% of the consumers stated that food at the vending site was prepared under unhygienic conditions. Twenty eight percent (28%) however said the food was prepared under hygienic conditions while 6% were not sure. All the

100 consumers agreed that food vendors should maintain the safety and quality of the food they sold to the general public.

Table 4.25: Food is Cheap at the Vending Site because of Poor Sanitation

Cheap food due to poor Sanitation	Frequency	Percentage
Yes	32	32
No	66	66
Not sure	2	2
Total	**100**	**100**

On the issue of whether the food was cheap at the vending sites because of poor sanitation, 32% said yes, 66% said no and the remaining 2% reported they were not sure as indicated in Table 4.25.

Table 4.26: Satisfaction with the Environmental Conditions under which Food is Prepared

Satisfied with Environmental conditions	Frequency	Percentage
Yes	20	20
No	32	32
Not Always	48	48
Total	**100**	**100**

On the issue of environmental conditions at the under which food is prepared at the vending sites, the data shown in Table 4.26 above revealed that 32% of the consumers were not satisfied while 20% said they were satisfied and 48% said they were occasionally satisfied giving a total of 68% consumers showing some degree of satisfaction. On whether any consumer had ever fallen sick after eating at the vending sites, 48% said yes while 52% said no.

Table 4.27: Diseases Suffered by Consumers after Eating Food

Disease	Frequency	Percentage
Diarrhoea	10	10
Stomach upset	48	48
Typhoid fever	20	20
Cholera	16	16
No Response	6	6
Total	**100**	**100**

As shown in Table 4.27, some diseases consumers suffered from after eating at the vending sites were 10% suffered from diarrhoea, 48% had stomach ache and 20% developed typhoid fever. Some consumers 16%) were down with cholera and 6% did not respond.

Table 4.28: Symptoms Exhibited by Victims

Symptoms	Frequency	Percentage
Vomiting	38	38
Diarrhoea	30	30
All of them	28	28
Don't know	2	2
Total	**100**	**100**

According to Table 4.28, the symptoms associated with diseases contracted after eating at the vending sites included: vomiting (38%); an associated symptom of food borne diseases, diarrhoea (30%) as a symptom, vomiting and diarrhoea (28%); 2% could not describe any symptoms. All consumers were of the view that construction sites should be approved by the relevant authorities before they were allowed to begin construction. Again all consumers were of the opinion that environmental officers should inspect vending sites regularly to inspect the operations of the vendors. All

consumers agreed that all food vendors who did not meet the minimum requirements of the Municipal Assembly should be refused license.

The first hypothesis states that there is no significant relationship between food vendor's knowledge of food safety regulations and food handling practices.

Hypothesis One

Table 4.29: Correlation between Food Vendor's Knowledge of food safety regulations and Practices

Variables	Correlation coefficient (r)	P- value
Knowledge of food safety regulations	0.330	0.019

Dependent variable: food handling

Level of significance is 0.05

The result from Table 4.29 shows that knowledge of food safety regulations had a correlation coefficient (r = 0.330) with food handling practices food vendors at 0.05 level of significance.

The second hypothesis states that there is no significant relationship between consumer's patronage food vending sites and food handling practices.

Hypothesis Two

Table 4.30: Correlation between Consumers' Patronage of Food Vending Sites and Food Handling Practices

Variables	Correlation coefficient (r)	P- value
Knowledge of food safety regulations	- 0.095	0.346

Dependent variable: food handling

Level of significance is 0.05

The correlation analysis shows further that consumers patronage had a negative correlation coefficient (r=-0.095) with food handling practices of vendors at 0.05 level of significance.

CHAPTER FIVE

DISCUSSIONS OF FINDINGS

5.0 Overview

This section deals with the discussion of findings derived from the analysis of data collected in the study. The findings have been discussed within the context of the literature reviewed and in relation to the following research questions.

1. What awareness do food vendors' in Koforidua have on of food borne diseases and the regulations governing their operations?
2. What are the current food handling practices of informal food vendors in Koforidua?
3. What training in food hygiene have been given to street food vendors?
4. How may the awareness of consumers in Koforidua on food hygiene and food borne diseases be assessed?

5.1 Demographic Characteristics of Food Vendors

The data gathered revealed that 84% of the food vendors surveyed were females and the remaining 16% were males. This agrees with findings of Lues, *et al* (2006), that street food vending is a common income-generating venture particularly for women in developing countries. Thus, the street food enterprises in Ghana, like São Paulo city in Brazil, Gauteng in South Africa and Bangkok in Thailand is dominated by females (Gobagoba & Littrell, 2003; Jimu, 2004). This is in contrast with the situation in Guwahati city (India), where Choudhury, Mahanta, Goswami, Mazumder and Pegoo (2011) recorded 88% males in street vending. In the present study, 8% were 20- 24, 12% of the vendors were 25-29, years of age, 20% were between 30-34, years 24% of the vendors were 35-39years and the remaining 36% were above 40 years. This was in contrast to a study conducted in Eldoret, Kenya which revealed that 56% of the

respondents were between 20-30 years, 16% were between 30-40 years, 23% were between 10-20 years, 3% were 40 years and above, and 2% were less than 10 years (Kitagwa *et al.,* 2006).

Low educational levels and lack of employment are the most important factors contributing to street vending businesses in developing countries. The data gathered from this study shows that 44% of the respondents were illiterates, 28% had at least primary school education, with 24% attaining secondary education the remaining 4% having had tertiary education. This was found to be similar to results found in other cities and countries (Chukuezi, 2010; Mensah *et al.,* 2002; Donkor, Kayang, Quaye & Akyeh, 2009; Muinde & Kuria, 2005; Omemu & Aderoju, 2008). In this study 40% had been selling food for 3-5years, 24% have been in the business for 1-2 years, another 24% for 6-10 years and the remaining 4% for more than a year. Fifty six (56%) of the vendors started the business due to unemployment.

5.2 Demographic Characteristics of Consumers

The research findings here revealed that male consumers exceeded the female consumers by 14%. This is in agreement with a study conducted by Umoh and Odoba (1991), which revealed that majority of consumers of street foods in West Africa were males. Ntiforo (2001) noted in a study he conducted in Ghana that the age range of consumers of vended foods ranged from 10 to 60 years. In the current study the age range of street food consumers was 10 to 40 years. In another study in Ghana the age range was between 23 and 48 years (MacArthur, 2007). This study confirms earlier studies conducted in India, Indonesia and Nigeria. These studies revealed that the range of the ages of the street food consumers was from 10 to 40 years.

5.3 Research Question One:

What awareness do food vendors' in Koforidua have on food borne diseases and the regulations governing their operations?

The first research question sought to find out food vendors knowledge of food borne diseases and regulations governing their operations. The findings revealed that the respondents were very much aware of food borne diseases and the food safety regulations governing their operations. (Table 4.8) Regarding the knowledge on food safety, 70% had some knowledge on laws regarding food hygiene and penalties for violating these regulations, while 30% had no knowledge on food hygiene at all. In Ghana, the Food and Drugs Law (PNDC Law 305 B) (1992), Amendment Act 523 (1996) and various bye-laws on food hygiene aim at ensuring that only safe and wholesome food, drugs and other substances are made available for public consumption. As stipulated by these laws, the sale of food under unsanitary conditions is an offence. 70% of food vendors had some knowledge of laws regarding the sale of food and were aware of these aspects of the law. However, only 48% of vendors were able to state correctly the reason for certification. The public health requirements insists on food handlers to undergo medical screening for infectious or contagious diseases such as typhoid fever, tuberculosis, cholera, dysentery and other communicable and air-borne diseases. Periodic screening is also a requirement by metropolitan, municipal and district environmental health officers and inspectors. The vendors are expected to carry out complete physical and medical examination and obtain health certificates issued by the authorized health centers (Ghana Public Health Act, 2012).

All the vendors questioned said they washed their hands frequently. However, twenty four percent (24%) of the food vendors washed their hands before handling food, 52% of them washed their hands after blowing their nose, 24% washed their hands after greeting people while the remaining 20% also washed their hands after visiting

the toilet. A study conducted by Abdalla *et al.,* (2009) reported that 74% of street vendors washed their hands because of contamination. Ninety two percent (92%) gave "after using the toilet" as a reason for hand washing (Abdalla *et al.*, 2009), 38% indicated that hands should be washed when handling raw foods and 46% indicated that they should be washed continuously while handling foods. Seventy eight percent (78%) indicated that hands should be washed with soap and water with 8% indicating that they should also be washed in hot water (Abdalla *et al.,* 2009). This was a good signal because Green and Selman (2005) noted that the most common source of food contamination was humans especially when the hand gets into contact with food items. The CDC indicated that hands were the cause of most enteric virus transmissions.

The National Restaurant Association Educational Foundation (2004) explained that hand washing was one of the fundamental practices that decrease the spread of food borne illnesses. Bhaskar Usman, Smitha and Bhat (2004) reported that defective personal hygiene could facilitate the transmission of pathogenic bacteria found in the environment and on people's hands from food to humans. The respondents knowledge on the keeping of working surfaces clean and the separation of raw and cooked food in the refrigerator was not encouraging since more than (50%) of the vendors were not aware that when raw and cooked foods were put together in the refrigerator it could result in contamination and food borne illness. Storage order should ensure that raw meats, poultry, and seafood were separated and place1d below ready to eat and cooked foods (WHO, 2007).

This study also revealed that food vendors do not check the temperature of food before storage. At an international conference on nutrition by FAO, (1992) it was resolved that if food could not be served immediately, it should be kept hot or cooled down rapidly and reheated completely to a temperature of at least 70C before eating.

This is to make sure that microbes will not thrive in the food because microbes flourish well between 10 C and 60 C. It was revealed that, food vendors used the same equipment for handling --both raw and cooked food. This implies that, food vendors were not aware that when the same equipment was used to handle both raw and cooked foods it resulted in cross contamination and subsequently food borne illnesses. Majority of the vendors reported that the reason for wearing apron was for identification. This is a clear indication that the food vendors did not know the purpose for which aprons are worn by food handlers.

The study also revealed 72% of the respondents knew who the environmental health officer is and the roles they play to ensure food safety. The Environmental Health Officer uses the knowledge and skills of the natural, behavioural and environmental sciences to prevent diseases and injury and to promote human well-being in terms of food control (Ghana Public Health Act, 2012). In this study, 80% of the respondents knew that improper waste disposal can lead to food borne diseases. The use of potable water at the vending site also helps to prevent food borne diseases.

The respondents knowledge needed to be confirmed by their food handling practices to ascertain whether their knowledge commensurate with their practices. A study conducted in Kumasi, Ghana by Rheinlander *et al* (2008) found that many vendors do in fact have sufficient knowledge to ensure hygiene handling of food, such as knowledge of the dangers of faecal contamination and serious food borne diseases. However, the knowledge was not turned into safe practices, not even by those vendors who had obtained formal training in cooking.

5.4 Research Question Two:

What are the current food handling practices of informal food vendors in Koforidua?

This research question was intended to find out the current food handling practices of informal food vendors in Koforidua with regards to food safety. With regards to the food handling practices of the food vendors in Oguaa, Koforidua, the study found that food vendors went for medical checkup but not on regular basis as they should and this indicated that the food vendors do not comply with the bye laws of the various agencies that govern their practices including that of the New Juaben Municipal Assembly. This corroborates with findings from other studies conducted in Nigeria by Musa and Akande (2003) which indicated that only 21% of food vendors in secondary schools at Ilorin had undergone medical examination and were issued with health certificates. Respondents cited the reasons for not having health certificates as non-awareness and lack of strict enforcements of bye laws by health authorities. This finding is in agreement with another study carried out in Accra, Ghana by Ackah, Gyamfi, Anim, Osei, Hansen and Agyemang (2011) in which only 40% of the respondents had acquired a health certificate.

A study conducted by Abdalla *et al.,* (2009) concluded that routine medical examination of food handlers must be carried out by health officers in the development of strategic plans towards regulating safe street food handling , preparation, and vending. Medical examination of food handlers, according to FAO/WHO (1997), it is necessary clinically or epidemiologically to ensure that people with communicable diseases are excluded from handling food. However, Abdulssalam and Kaferstein (1993) argued that medical examination of food vendors prior to licensing, or at intervals afterwards does little towards ensuring food safety and should not be mandatory. This notwithstanding, as a precaution, Section 286 of the Criminal Code,

(Amendment) Act, 2003 (Act 646) of Ghana charges all food vendors to be examined to ensure that they do not infect consumers with communicable diseases.

Ninety six percent (96%) of food vendors admitted using pipe borne water in preparing food at the vending sites but from observation, 84% of the food vendors actually had access to pipe borne water at the vending sites, but the tap does not flow at the site and the vendors store water in containers for use in their operations. Containers for storing water should always be covered but only 64% of the food vendors covered their water containers at the vending sites. On account of the freshness of raw food, almost all the vendors reported they checked the food purchased to make sure they were fresh before purchasing in order to prevent food borne illnesses that may occur.

Eighty percent (80%) of the vendors reported they kept cooked food (soups and sauces) in pots on the source of heat and served consumers from the pots which kept the food hot until it got finished. They added that when the food got cold they reheated the food before serving. However observation revealed that 10% of vendors sold food that was not as hot as they said during the interview. This was in agreement with some previous studies that noted that food stalls often lacked the necessary storage (refrigeration and cooking) facilities to prevent contamination by bacteria (Hanoshiro, Morita, Matte, & Matte, 2005; Ghosh, Wahi, & Ganguli 2007). Adequate temperature in cooking and storage of foods is important to minimize the growth of bacteria foods that cannot maintain within the safety temperature zone act as incubators for pathogenic bacteria whether the food is raw, partially cooked or fully done (Roller, 1999; Abdalla *et al*., 2009). Besides 20% of the respondents did not cover the cooking pots and saucepans in which the food was cooked and subsequently kept for sale. This is a bad practice since uncovered food is prone to microbes.

Ideally hands and dirty dishes are to be washed with warm water and soap. The temperature of the water helps to kill microorganisms that might be in the water, on the hands and on the surfaces being cleaned. This study revealed that food vendors did not provide warm water for washing hands. According to HACCP model, proper hand washing procedures include not only water, but the use of water as warm as the hands can comfortably stand. The hands are moistened, soaped thoroughly, and latter to the elbow, scrubbed thoroughly, a brush is used for nails, the hands are then rubbed

together using friction for 20 seconds, rinsed thoroughly under running water of at least 100ºF and then the hands and arms are dried with single-use paper towels or a clean dry towel (WHO, 2006). However, in this study food handlers and consumers did not wash their hands under running water, only 28% had access to such a facility. Some vending sites provided small bowls for individual customers, while others put a jug of water on each table and consumers washed their hands into the bowls. Only 44% washed their hand frequently in the present study. Since respondents who did not wash their hands frequently while handling food were in the majority, it is a matter of great concern in the food industry.

Again this study revealed that food vendors did not use warm water to wash used dishes. Similarly, 12% of vendors did not use washing powder or liquid soap to wash utensils but still used cake soap. Water for washing utensils and used dishes were also not discarded frequently. Since utensils were washed using water in bowls, the utensils were rinsed only once and the water was used repeatedly before it was replaced. Because of this water for washing and rinsing utensils was observed to be dirty. This was due to the fact that there was no running water at the vending sites and this resulted in vendors using little water for washing utensils. This study agrees with a study conducted in Accra by Mensah *et al* (2002) who found insufficient water at vending

sites. The World Bank (1995) asserts that safe water is an essential pillar for health. Latham (1997) also stated that personal hygiene could be achieved only if adequate water was available. In view of this, food vendors should have sufficient potable water at vending sites for food preparation and for all washing up operations. Bhaska Usman, Smitha and Bhat (2004) and Mosupye and Holy (2000) reported that, bacteria from dirty dish washing waters and other sources on utensil surfaces constitute a risk for contamination during food vending. Some food vendors in the present study provided clean hand towels while others did not.

All respondents said they put portions of cooked food on their palm and lick it whenever they wanted to taste the cooked food during preparation. However, it was observed that most of the vendors tasted food using the ladle which they did not wash and used the same ladle to stir or re-taste the food. Those who really put the food on the palm and licked it did not also wash their hands after tasting food. This could also lead to food contamination. The discrepancies between food safety training and food safety practices in the workplace need to be examined. Studies agree that food safety interventions provide knowledge to food workers with the expectation that workers will translate this knowledge into practice (Green, 2008).

On the disposal of waste the vendors reported they liaised with Zoom Lion Ghana and the Municipal Assembly to dispose of their refuse. It was observed that 72% of the vendors did not cover their dustbins while they waited for those responsible for collection and these attracted flies to the vending sites. This agrees with Muinde and Kuria (2005) who found houseflies in most street food stalls in Nairobi. Mwadime (2001) noted house flies in 54.8 % of vending stalls. This implies that food contamination is most likely to occur despite efforts to keep the stalls clean.

With regard to the environment of the vendors, the study revealed that 56% of the vendors maintained a clean environment but the remaining 44% did not. According to the FAO (1997), environmental hygiene of premises is very crucial. Depending on the nature of the food preparation, vending operations, and associated risks, the food premises and utensils should be designed and fitted in such a way that they are easy to maintain and disinfect to ensure that food contamination is kept to a minimum.

Most vendors were observed not using easy cleanable surfaces and as such surfaces were not cleaned properly. Studies have indicated that ready to eat foods and food preparation surfaces may be reservoirs for microbial contamination (Mankee *et al.,* 2005; Ghosh *et al.,* 2007; Christison *et al.,* 2008). Street foods in some African countries have been tested for various microorganisms of public health concern. Faecal coliforms i.e. *Escherichia coli*, *Staphylococcus aureus*, *Salmonella* species and *Bacillus cereus*. *Escherichia coli* and *Staphylococcus aureus* were recovered in a significant proportion of the food, water, hands and surface swabs tested in Harare, Zimbabwe (FAO/WHO, 2005). The Minnesota Department of Health Consumer Fact Sheet (WHO, 2007) indicated that, clean cutting board should always be used.

A few of the food vendors were observed wearing aprons and hair coverings which was agreement with a study conducted by Hanoshiro *et al*. (2004) in Brazil who pointed out that only 5.5% and 8% of street food vendors respectively wore caps and aprons. Another study conducted in Bloemfontein South Africa in 2006, 71% of street food vendors observed wore head coverings during food preparation (Leus *et al*, 2006). These figures were very discouraging and showed a high health risk as was revealed by Adjrah *et al.* (201 3) that poor hygiene practices, particularly deficiency of aprons and caps wearing could be a causative factor of contamination of the analyzed samples.

In contrast to the above findings, a study conducted by Campbell (2011) in Johannesberg revealed that 90% wore aprons and 83% wore head coverings. In the present study it was observed that the few food vendors who wore aprons did not wash them frequently. This was in consonance with study by Paulson (1994) which stated that (46.6%) vendors wore moderately clean clothes (13.4%) vendors were dirty which is considered to be a serious health issue.

Thirty six percent 36% of food handlers in the study used separate equipment for raw and cooked food. The remaining 64% used the same equipment for handling both raw and cooked food which is a high risk practice. Results of a study conducted in Ghana by Nahami and Odonkor (2012) agree with the findings in this study. It was revealed in this study that 53.81% of food handlers used the same knife for both raw fresh produce and ready-to-eat food items. Disturbing percentages of 31.43% did not apply any treatment to the knife in-between use, 20.95% rinsed with only water and) 8.75% wiped the knife with a towel which were not washed regularly. The risk of food borne infection from cross contamination among respondents was high. With the exception of "fufu" which vendors have no option than to use the bare hands to handle, 4% of the vendors were seen to dish out food not with bare hands but with either a spoon or ladle. This differs from findings by Muinde and Kuria (2005) in Nairobi that 60% of street food vendors handled food with their bare hands. Clean tongs, forks, spoons or disposable gloves should be used when handling, serving or selling food. This is because handling with bare hands may result in cross contamination and the introduction of microbes on otherwise safe food,

It is noteworthy to state that none of the food handlers in this study were seen using rusted and chipped equipment and tools. Again almost all the respondents observed did not use their bare hands to serve food. A study carried out in Accra

(Mensah *et al.* 2002) revealed that street food vendors purchased their cooking pots and other utensils from both formal and informal manufacturers/retailers. Hence some of the street food samples might have higher levels of lead, cadmium, arsenic, mercury, and copper than average food samples, suggesting possible leaching from the metal utensils. Tests by Mensah *et al.* (2002) showed that lead from pots obtained from informal manufacturers could leach into the food. These pots are manufactured using scrap metal that could come from diverse sources such as derelict cars, car batteries and industrial machinery which are obviously not suitable for use with foods and their continued use must be discouraged (Mensah *et al.*, 2002).

5.5 Research Question Three:

What training in food hygiene have been given to street food vendors?

This research question was raised to find out if food vendors have been trained on food hygiene practices. The study revealed that only 60% of the food vendors were trained and certified to cook food for sale which is a very important requirement in food vending. These unsatisfactory results were in agreement with a study conducted in Ghana by Annan-Prah *et al.* (2011), who observed that 45% of street food vendors in Cape Coast Ghana were not certified medically to handle food. Another study conducted by Musa and Akande, (2003) revealed that 60% of the food vendors interviewed had no health certificate which is an indication that they have not been trained. Some of the food vendors who were not trained explained that they were not trained because of time constraints since training sessions normally coincide with their peak periods. A study in Konongo, Ghana had a similarly reported that, 52.6% of food vendors were without medical examination certificates because they were not aware of the requirement whereas others gave reasons such as lack of finances, not a necessary

requirement and too busy to make time for medical screening as justification for not having been medically examined.

According to WHO (2006), food handlers should have the necessary knowledge and skills to enable them to handle food hygienically. The FAO/WHO as well as Chukuezi (2010) further highlighted that food vendors were required to undergo basic training in food hygiene before licensing and any further training as required by the relevant authorities. This is necessary because inadequate hygiene training and/or instruction and supervision of all people involved in food related activities pose a potential threat to the safety of food and its suitability for consumption. Food safety training attempts to improve employees' food safety practices (Pilling *et al*., 2008). Since poor personal hygiene, cross-contamination, and time-temperature abuse are the three main causes of food borne illness, there is a need for food safety and sanitation training to be conducted and maintained on a regular basis in foodservice establishments.

This study also revealed that, the food vendors stated varying periods for training. Some of them said they were trained for 1-3 days, others said they were trained for one week while others were trained for one month. However the duration for training may not have a great impact on food vendor's food safety practices. A study in Oklahoma County found that there was no significant difference between the number of hours of training and improvement of food safety practice (Lynch, Elledge, Griffith, & Boatright, 2005). Employees must have a firm understanding of food safety and more importantly employees must be obligated to actively practice sanitation in the workplace at all times.

All trained food vendors in this study admitted being trained at workshops organized by the Municipal Assembly health officers. The main focus of the workshops

as revealed by the study was food and environmental hygiene. Training is critical to any system of food hygiene. Training, instruction and proper supervision increase the potential of the food vendors.

5.6 Research Question Four:

How may the awareness of consumers in Koforidua on food hygiene and food borne diseases be assessed?

The researcher wanted to find out what the knowledge of consumers is with regard to food hygiene and food borne diseases. The findings of the study revealed that 82% of the consumer's patronized food at the vending sites mainly because prices were affordable compared to food sold at the formal food establishments. This is in agreement Tambekar *et al.* (2008) with the findings of a study that street foods feeds thousands of people daily with a large range of foods that are relatively cheap and easily accessible. Consumers were of the view that food at the vending sites was nutritious, filling and tasty in agreement with Maxwell (2000.) Street foods play significant nutritional role for consumers, particularly for middle and low-income sectors of the population, who depend on it for their main food intake (Mensah *et al.,* 2002). FAO reports that street foods provide nutritionally balanced diets, sufficient in quantity and presenting options for variety and choice for consumers, particularly from middle and low-income sectors of the population, who depend heavily on them (FAO, 1997).

Some studies revealed that the people who depend on street foods are often more interested in its convenience than on the question of its safety, quality and hygiene (Mensah *et al*. 2002; Muinde & Kuria, 2005). However, in this study 66% of the consumers reported that food at the vending sites were prepared under unhygienic conditions and as such could easily be contaminated. In the present study it is assumed that most consumers patronized street food because of its proximity to their places of

work. Some of the consumers reported they sometimes suffered from food borne diseases after eating from the vending sites. This has been confirmed in a study conducted by Opare-Obisaw (1990) in Accra Ghana which revealed that consumers were aware of the unhygienic conditions of street foods and its subsequent health dangers but ignored these dangers and continued to patronize these foods due to time constraints and proximity to the place of work or institutions.

The consumer's knowledge of food borne diseases in the present study was adequate since majority of them were able to identify some food borne diseases and even went further to mention their symptoms. They mentioned such diseases symptoms as diarrhoea, stomach pains, typhoid fever and cholera. They raised the concern that this may be as result of the unhygienic environmental conditions under which they prepared and sold their food. This findings are in contrast with the a study conducted in South Africa by Kitagwa *et al.* (2006) where some of the consumers mentioned malaria and scabies as examples of food borne diseases. The findings in this study (Table 4. 24) on the issue of consumer's high knowledge of food borne diseases may be due to the fact that all the consumers used were literates.

All consumers were aware that, construction of vending sites should be approved by relevant authorities to make sure they met laid down the standard requirements. According to FAO (1995) foods should be prepared in a place set aside exclusively for that purpose, while the place of preparation should be kept clean at all times and should be far from any source of contamination such as rubbish dumps, waste water, dust and animals). Vending stalls should be designed and constructed so that they are easily cleaned and maintained.

The FAO (1995) also reported that environmental health officers should visit vending sites regularly to inspect their operations and vendors who did not meet

minimum standards should be condemned an closed down. The respondents admitted that for food to be safe for human consumption, it should always be covered to protect them against entry of flies and other harmful insects. On the issue of whether they deem it important that all food vendors should be trained, they responded that food vendors should be trained and given license to operate.

5.7 Hypotheses One

The first hypothesis states that there is no significant relationship between food vendor's knowledge of food safety regulations and food handling practices.

The first null hypotheses which stated that there is no significant relationship between the knowledge of food vendors on food safety regulations and their practices was rejected. The result shows that knowledge of food safety regulations ($r = 0.330$) had a significant relationship with food handling practices at 0. 05 level of significance. This implies that the more the food vendors are aware of food safety regulations the better their food handling practices. Therefore, there was a significant relationship between knowledge of food safety regulations by food vendors and their food handling practices.

5.8 Hypotheses Two

The second hypothesis states that there is no significant relationship between consumer's patronage of food vending sites and food handling practices.

The second hypothesis which stated that there is no significant relationship between consumer's patronage food vending sites and the hygienic conditions of the vending site was retained. The correlation analysis shows further that consumers patronage ($r=-0.095$) had negative and non-significant relationship with food handling practices. The inverse relationship could be as a result of proximity of vending sites to

the consumers and affordable prices of food sold by the vendors. Therefore, there was no significant relationship between consumers' patronage and food handling practices.

Mensah *et al*. (2002) discovered that people who depend on street foods were often more interested in its convenience than the safety, quality, and hygiene of food. Again, according to Opare-Obisaw, (1990) consumers were aware of the unhygienic conditions of street food and its subsequent health dangers but ignore the dangers and continue to patronize street vended foods due to time constraints, affordable prices, and proximity.

5.9 Summary

This chapter dealt with discussions of data obtained in relation to the research questions of the study and analysis of findings based on reviewed literature of the study.

CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Overview

This chapter presents a summary of the major findings of the study which examined the food handling practices of street food vendors in Koforidua and consumers' knowledge about food borne diseases. The chapter includes a summary of the research findings, conclusions from the results obtained and recommendations for further studies.

6.1 Summary of Findings

The study sought to investigate the food handling practices of the street food vendors in Koforidua and how their practices affected the safety of the food before consumption and consumers knowledge of food borne diseases. The descriptive survey design was used and the findings were discussed using frequencies, percentages and tables.

The findings of the study are as follows:

1. Majority of the street food vendors used for the study were females and mostly above 40 years. Most of them were illiterates with only 4% having gone through tertiary education. They joined the trade mainly because of the lack of employment.
2. Majority of the food vendors have knowledge of food safety as well as the laws that govern their operations. Only a few of the food vendors were able to state the reason why they should be certified before being allowed to sell food to the general public.
3. All food vendors used for the study lacked knowledge on the importance of keeping working surfaces clean, the separation of raw and cooked food in the refrigerator and their knowledge on the use of separate equipment for raw and cooked food was not encouraging.
4. All food vendors knew cooked food should be properly covered to protect the food from flies dust and other harmful substances.
5. Majority of the food vendors were aware that improper waste disposal could lead to contamination of food at the vending sites.
6. Some food vendors did not go for medical checkup as stipulated by the laws that govern their operations.

7. Pipe borne water does not flow most of the time at the vending site and containers used for storing water are not covered by majority of the respondents.
8. Majority of the food vendors did not check the temperature of food before storage and they did not serve food hot.
9. Warm water was not provided at the vending sites for the washing of hands and for washing up utensils.
10. Majority of food vendors did not wash their hands frequently and hands were not washed under running tap water with liquid soap or detergents.
11. Solid waste was not disposed of well at most of the vending sites which attracted flies to the place.
12. Dishes were washed in bowls using cold water and soap and the water was not replaced frequently i.e. the water was used over and over again.
13. Only a few of the vending sites provided clean towels for consumers to clean their hands after eating.
14. Majority of the food vendors did not wear aprons as well as hair coverings during the preparation and serving of food at the vending sites.
15. Some of the food vendors (40%) had not been trained but were found cooking and serving at some vending sites and the trained food vendors showed inconsistencies regarding the length of the training period.
16. All trained food vendors were trained in food and environmental hygiene certified by the New Juaben Municipal Environmental Health officers. The quantitative data indicated food vendors' knowledge acquired through training was put into practice. However, observation showed the knowledge they acquired through training programmes was not reflected in their food handling operations.

17. Majority of the consumers patronized street foods because prices were moderate as compared to the formal establishments.
18. Majority of the consumers reported the food at the vending sites were prepared under unhygienic conditions.
19. Consumers had knowledge of food borne diseases while a minority was adversely affected after eating from food vendors.
20. Majority of the consumers said the food sold at the vending sites should be covered properly.
21. The consumers were aware that Environmental Health Officers should visit and inspect food vending sites.

6.2 Conclusion

This study has shown that some street food vendors do have some knowledge in hygienic food handling practices through the training they receive but the knowledge they acquire are not put into practice. The poor food handling practices is likely to have some adverse implications on the health of the consumers of the vended foods. Effective and regular inspections by Environmental Health officers coupled with stringent enforcement of all regulations governing their practices as has been identified earlier would go a long way to streamline the activities of the food vendors for better health of their consumers. Also, the consumers of vended foods used in this study also have some knowledge of food hygiene and food borne diseases; however, they ignore the health hazards associated with poor food handling by food vendors and go ahead to patronize the food the vendors provide.

6.3 Recommendations

These recommendations if implemented will help minimize the prevalence of food borne diseases in Koforidua and the nation as a whole. Based on the findings of the research, the following recommendations were made which are in tune with the objectives for the study.

1. The Food and Drugs Authority, the Ghana Tourist Board and most especially The New Juaben Municipal Assembly Health officers, should ensure that, street food vendors in Koforidua are well informed on issues bordering food hygiene and food borne diseases and their effects on individuals. The reasons for the various regulations governing their practices should be clearly spelt out to enable them put the knowledge they acquire into practice.
2. The Metropolitan/Municipal/District environmental health officers should ensure that inspection of street food vendors are carried out effectively, efficiently and regularly so as to monitor the food handling practices of the food vendors' right from the time of preparation to the point of sale. This is to ensure that food served to consumers is safe for consumption. Vendors who do not put the knowledge they have acquired into practice should have their certificates retrieved and signed up for retraining.
3. The training and certification of food vendors should be organized on regular basis and should be designed using the Hazard Analysis of Critical Control Point (HACCP). Environmental Health Officers must conduct follow up exercises after training programmes to ascertain whether food vendors are putting knowledge they have acquired into practice,
4. Consumers of vended foods should be educated to help improve upon their knowledge in food hygiene and food borne diseases to enable them make

informed choices and also prompt regulatory bodies such as the environmental health officers on unacceptable food handling practices of food vendors.

6.4 Suggestions for Future Studies

The study sought to investigate the food handling practices of the street food vendors in Koforidua and how their practices affects the safety of the food before consumption and consumers knowledge of food borne diseases. Further research should be conducted using the pre-test and post-test design, to test food samples and also conduct intervention training for food vendors in Koforidua.

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APPENDIX A

FOOD HANDING PRACTICES OF INFORMAL FOOD VENDORS AND CONSUMER PERCEPTIONS IN KOFORIDUA

QUESTIONNAIRE FOR FOOD HANDLERS

This questionnaires is designed by the researcher to enable her obtain information to help her carry out a study on the above topic for assessment of food vendors in the informal food sector in Koforidua.

All information given will be kept confidential

Thank you for taking part in this exercise

Please answer the following questions in the various sections as accurately as possible

Please thick where appropriate

(Q1) Demographic Data

i. Where do you come from? .....

ii. Gender

(a) Male ☐	**(b) Female** ☐

iii. Age

(a) 20 -24 years ☐	**(b) 30 – 34 years** ☐
(c) 25- 29 years ☐	(d) 35-39 years ☐
(e) 40 and above ☐	

iv. Level of education

- **(a) Basic education** ☐
- **(b) Secondary** ☐
- **(c) Tertiary** ☐
- **(d) None** ☐

v. Which language do you speak?

- **(a) English** ☐
- **(b) Akan** ☐
- **(c) Damgbe** ☐
- **(d) Guan** ☐

(e) Others specify:

……

vi. Can you read and write?

(a) English	**Yes**	☐	**No**	☐
(b) Akan	Yes	☐	No	☐
(c) Damgbe	Yes	☐	No	☐

(d) Others specify:

……

vii. What is your religion?

(a) Christian ☐

(b) Muslim ☐

(c) Traditionalist ☐

(d) Other specify:

……

viii. For how long have you been at this vending site?

(a) less then 1 year ☐

(b) 1 -2 years ☐

(c) 3 – 5 years ☐

(d) 6 – 10 years ☐

(e) Above 10 years ☐

ix. Reasons for business (owners only)

(a) Unemployed ☐

(b) Business opportunity ☐

(c) Other specify:

……

x) Do you have a license? (owners only)

a)Yes ☐ **b) No** ☐

Q2. Knowledge

i. Are you aware of any food safety regulations?

(a) Yes ☐ **(b) No** ☐

ii. Frequent hand washing is good

(a) Yes ☐ **(b) No** ☐

iii. If answer to 2(II) is yes when do you wash your hand? Tick where applicable

(d) Before handing food ☐

(e) After blowing the nose ☐

(f) After greeting people ☐

(g) After visiting the toilet ☐

(h) Other specify ☐

……

iv. Keeping working surfaces clean reduces risk of illness

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

v. Storing raw and cooked foods separately in the refrigerator help to prevent illness

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

vi. Do you check the temperature of food during storage?

(a) Yes ☐ **(b) No** ☐

vii. Do you cover the cooked food properly?

(a) Yes ☐ **(b) No** ☐

viii. Do you think improper waste disposal can lead to contamination of food?

a) Yes ☐ b) No ☐

ix. What is the purpose of wearing uniform?

(a) For identification ☐

(b) For protection ☐

(c) To be smart ☐

(d) All the above ☐

x. At what temperature do you serve cooked food to customers?

(a) Very hot ☐ **(b) Hot** ☐ **(c) Cold** ☐

xi. Cooked food should be thoroughly reheated before serving

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

Q3 Attitude

i. Are you satisfied with the sanitation of the environment of your vending sites?

(a) Yes ☐ **(b) No** ☐

ii. If answer is no, what should be done to improve the sanitation?

……

iii. Food sold by food vendors is unsafe for human consumption

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

iv. How do you relate to your consumers?

Q4. Practice

i. Do you go for medical checkup regularly?

(a) Yes ☐ **(b) No** ☐

ii. If your answer is yes, how often?

(a) once in three months ☐

(b) once in six months ☐

(c) once every year ☐

(d) others specify ☐

iii. What is your source of water?

(a) Pipe borne water ☐

(b) Bore hole ☐

(c) Rain water ☐

(d) Others specify:

…..……

iv. How do you keep your food before preparation?

(a) In a cupboard ☐

(b) On shelves ☐

(c) In baskets ☐

(d) Other specify:

……..

v. Do you inspect food for freshness to ensure quality ingredients?

(c) Yes ☐ **(d) No** ☐

vi. How do you keep food after cooking?

(a) in sauce pans ☐

(b) In pots ☐

(c) In warmers ☐

(d) Others specify:

……

vii. Do you use hot water to wash utensils?

(a) Yes ☐ **(b) No** ☐

viii. How often do you wash your uniform?

(a) Once a week ☐

(b) Twice a week ☐

(c) When it is dirty ☐

(d) Daily ☐

ix. Do you taste food while cooking?

(a) Yes ☐ **(b) No** ☐

x. If answer to (ix) is yes, how do you taste it?

(a) By dipping finger in food and licking it ☐

(b) Licking the ladle/cooks spoon ☐

(c) Putting portion on palm and licking it ☐

(d) Putting portion on a plate and testing it ☐

xi. Where do you dispose your solid wastes?

(a) Throw in the open ☐

(b) Communal collection municipal point ☐

(c) Feed to animals ☐

(d) River/water body ☐

(e) Burn ☐

(f) Other combination ☐

(g) Don't know ☐

xii. With what do you wash your hands?

(a) Cold water and dry it with your uniform ☐

(b) Cold water soap and dry it with towel ☐

(c) Hot water and dry it with your uniform ☐

(d) Hot water, soap and dry it with towel ☐

(e) Hot water, soap and dry it with your unifor ☐

(f) Hot water, soap and shake it ☐

(g) Cold water and shake it ☐

xiii. Do you have cold and hot water?

(a) Yes ☐ **(b) No** ☐

Training facilities

i. Do you require training?

(a) Yes ☐ **(b) No** ☐

ii. Have you had any training (formal/education) in food handling?

(a) Yes ☐ **(b) No** ☐

iii. If answer to (XI) is yes, how long was the training?

(a) 1 -14 days ☐

(b) I month ☐

(c) Two months ☐

(d) 6 -12 months ☐

(e) Others specify:

……

iv. Where did you train?

(i) Workshop ☐

(j) Health institution ☐

(k) On the job ☐

(l) Others specify ☐

v. Who organizes the training programmes?

vi. How often do they organise such training?

i) once a year ☐

ii) once everey two months ☐

iii) every six months ☐

iv) Every month ☐

Environmental Health Control

i Environmental health officers should visit and inspect food vendors from time to time

(a) Yes ☐ **(b) No** ☐

ii There should be portable water at vending sites

(a) Yes ☐ **(b) No** ☐

iii There should be laws and regulations that govern food vendors

(a) Yes ☐ **(b) No** ☐

iv. Do you have toilet facilities?

(a) Yes ☐ **(b) No** ☐

v. If no, where do you help yourself?.....

vi. Do you use separate equipment and utensils such as knives and cutting boards for handling raw and cooked foods.

(a) Yes ☐ **(b) No** ☐ **(c) Don't** ☐

vii. What methods are used in disposal of waste?

(a) Burning ☐

(b) Dumping ☐

(c) Collection by zoom lion ☐

(d) Others specify: ……

APPENDIX B

FOOD HANDING PRACTICES OF INFORMAL FOOD VENDORS AND CONSUMER PERCEPTIONS IN KOFORIDUA

OBSERVATION CHECKLIST (FOOD HANDLERS)

THINGS OBSERVED	YES	NO
A container with a cover for storing water bowls /sinks for washing dishes and utensils		
Washing powder or liquids soap to wash dishes		
Dustbins with covers		
Apron		
Plastic table cloth		
Cooking pots with lids		
Clean hand drying towels		
Brooms and mops		
Proper solid and liquid waste disposal		
Correct washing of hands		
Correct tasting of food when cooking		
Easy cleanable working surfaces		
Utensils washed in hot and cold water Hot water for hand washing		
Proper storage of food after cooking		
Correct temperature of food		
Safe water		
Toilet facilities		
Presence of pest and rodents		
Frequent washing of hands		
Utensils are used for serving		
Equipment and tools are rusted, cracked and chipped		
Frequent discarding of water for washing utensils		

APPENDIX C

FOOD HANDING PRACTICES OF INFORMAL FOOD VENDORS AND CONSUMER PERCEPTIONS IN KOFORIDUA

QUESTIONNAIRE FOR CONSUMERS

This questionnaires is designed by the researcher to enable her obtain information to help her carry out a study on the above topic for assessment of food vendors in the informal food sector in Koforidua.

All information given will be kept confidential

Thank you for taking part in the exercise

Please answer the following questions in the various sections as accurately as possible

Please thick where appropriate

(Q1) Demographic Data

i. Do you live in Koforidua? a)Yes ☐ b) No ☐

ii. Gender

(a) Male ☐ **(b) Female** ☐

iii. Age

(a) Below 20 years ☐ **(b) 31 – 40 years** ☐

(c) 21 -30 years ☐ (d) Above 40 years ☐

iv. Level of education

(a) Basic education ☐

(b) Secondary ☐

(c) Tertiary ☐

(d) None ☐

v. Are you working

(a) Yes ☐ **(b) No** ☐

Q2)

i. Do you eat at the chop bar and other stationary vending sites regularly?

(a) Yes ☐ **(b) No** ☐

ii. Do you agree that low and affordable prices of food sold by vendors attract many customers?

(a) Yes ☐ **(b) No** ☐

iii. Do you think food at the vending sites is of low quality?

(a) Yes ☐ **(b) No** ☐

iv. If no, in which way

(a) Tasty ☐

(b) Filling ☐

(c) Nutritious ☐

(d) Enough ☐

v. Food at the vending site is prepared in unhygienic environment

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

vi. Food vendors should maintain safety and quality of food at all times

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

vii. Food is cheap at the vending sites because of poor sanitation

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

viii. Are you satisfied with the environmental conditions under which food is prepared?

a) Yes ☐ b) No ☐ (c) Not always ☐

ix. Have you ever suffered a disease after eating at the chop bar or other stationary vendor?

(a) Yes ☐ **(b) No** ☐

x. What disease can you get after eating contaminated food?

xi. What are the associated symptoms?

(a) Vomiting ☐

(b) Diarrhoea ☐

(c) Loss of weight ☐

(d) All of them ☐

(e) Don't know ☐

xii. Construction of food structures should be approved by the relevant authority

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

xiii. Environmental health officers should from time to time visit and inspect sales of food prepared at the vending site

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

xiv. Vendors who do not meet the minimum health requirements should be condemned and closed.

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

xv. Food should always be covered to protect them against entry of dust, flies, insects

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

xvi. All vendors should have valid license

(a) Yes ☐ **(b) No** ☐ **(c) Don't know** ☐

xvii. How do food vendors relate to you?