

**ASSESSMENT OF FOOD SAFETY IN THE BREAD SUPPLY
CHAIN IN EKITI STATE, NIGERIA**

BY

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NOVRMBER, 2017

DECLARATION

I, **OMONIYI, SAMUEL OLUWATOBILOBA** humbly declare that this work entitled **ASSESSMENT OF FOOD SAFETY IN THE BREAD SUPPLY CHAIN IN EKITI STATE** is as a result of my research effort carried out in the department of Agric. Economics and Extension, Faculty of Agriculture, Federal University Oye-Ekiti, under the supervision of **FAKAYODE S.,B (PhD)**. I further wish to declare that to the best of my knowledge, it contains no materials previously published or written by another person or material which to a substantial extent has been accepted for any other degree of diploma of any university or institute of higher learning except where due acknowledgement has been made in the text.

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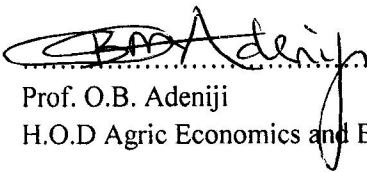
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CERTIFICATION

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DEDICATION

This piece of work is dedicated to the Glory of Almighty God, the giver of all good and perfect gift. Also to my Parents; Mr and Mrs Omoniyi for being there for me.

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As I began to think of all the people to whom I would like to express my appreciation to, for their support, suggestion and hard works in making the research work a success, the list is larger than I thought.

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Thanks

ABSTRACT

Bread is an important staple food that does not require further processing before consumption. Despite the awareness created and efforts of government to ensure that quality bread are available for consumption of all, there are several routes through which bread is being contaminated. Problems such as accelerating bread production, unsafe packaging and unhygienic handling of finished bread is emphasis in the study so therefore, assessments of sanitation and hygiene practices among bakers and bread sellers is surveyed. The design for the study was a descriptive cross-sectional survey. Twenty (32) bakers and ninety six (96) bread sellers were sampled for the study via the simple random and convenient sampling techniques. Data was gathered using questionnaire. The study revealed that most of the respondents had poor and/or inadequate knowledge of food hygiene and sanitation and only a third of bakeries assessed had good hygiene while hygiene of bread sellers was suboptimal. Therefore, regulatory agencies, States ministries of health and environmental health units of local government areas should ensure compliance and adherence of bakeries and bread sellers to the regulations and public health ordinance guiding the approval and monitoring of bakeries as a regulated premise

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the study

Food Safety is a scientific discipline describing the handling, preparation and storage of food in ways that prevent foodborne illnesses. Stages of Food safety include: Harvesting, production, processing and preparation, storage, packaging, transportation and sales. Globally, access to safe food is a basic human right.

In this regard, Ready To Eat food (RTE) refers to food that could be eaten as purchased and does not require further significant processing other than reheating or completion of a cooking process (*Singh et al., 2014*). Such Ready To Eat food items includes Bread, doughnut, fruits, Garri, and vegetables. Related to the food safety issue is the Foodborne illness (FBIs) commonly known as food poisoning, foodborne illness is caused by eating food that is contaminated by bacteria or other harmful substances. For Africa, food poisoning accounts for approximately 91 million peoples' illness, kills 137000 people representing one thirds of the global death toll for foodborne diseases. Foodborne diseases can be deadly, especially in children less than 5 years old yet the diseases are preventable.

According to *Ifeadike et al (2012)*, in the developing countries, biological contaminants, largely bacteria and other parasites constitute the major causes of food-borne diseases often transmitted through food, water, nails and fingers contaminated with faeces. Hence, food handlers with poor personal hygiene could be potential source of infections by these micro-organisms. They further state that biological contaminants are responsible for a wide range of diseases, including cholera, campylobacteriosis, e- coli gastroenteritis, salmonellosis, shigellosis, typhoid and paratyphoid fever, brucellosis, amoebiasis, and poliomyelitis, whereas, general good house-keeping, food

handling, preparations, servicing practices, dish washing facilities, conditions of cooking utensils, food storage systems, as well as food handlers' knowledge and practices all affect safety directly or indirectly.

Also one of the readily available Ready to eat foods is bread, which is staple food that does not require further processing before consumption. It is produced in various forms and eaten in homes, restaurant and hotels in Nigeria (*Emeje et al., 2010*). In addition, the consumption of bread cut across socio-cultural and religious barriers. Bread is a food of choice for both the rich and poor in Nigeria (*NAFDAC, 2010*). Bread is prized for its taste, aroma, quality, appearance and texture and retaining its freshness is important to keeping it appetizing and appealing to consumers.

A total of 2.5 billion people all over the world eat street foods everyday (Food and Agricultural Organization (FAO), 2007). The world is becoming rapidly more urban and the population of the developing countries is projected to double from 1.7 to 3.4 billion in 2020. Deprivation in urban areas including poverty, food insecurity and malnutrition is increasing faster and urban growth now present a serious challenge in developing countries (*Maxwell, et al., 2000*). Street foods are ready-to-eat foods prepared and/or sold by vendors and hawkers, especially in streets and other similar public places which include schools, markets and motor parks (*Muleta and Ashenafi, 2001*).

1.1.1 The bread Industry in Nigeria

Nigeria has several food safety legislations, food is prepared in diverse socio and environmental settings and frequently contaminated with naturally occurring pathogenic microorganisms (*Abdalla et al., 2008*). Along this vein is the , concern on the safety of bread which have

increased following the indiscriminate use of potassium bromate during its making while the storage. The, handling process, the condition of the bread processing environment and health of the workers in the cottage industries and street hawkers are important considerations in ensuring the safety of consumers (*Isong et al., 2013*). Bread is made from low protein flour made from wheat or cassava and contains several ingredients that improve its quality. Some of the ingredients added to bread are table salt, sugar, flavour and at least an efficient oxidising additive to assist in the raising process and to produce a texture in the finished product that is appealing to the consumers (*Emeje et al., 2010*). The quality of food is dependent on the product safety: i.e. the guarantee the producer gives to the consumer that the food is safe and will not cause any sickness or other harm. To ensure this, producers have to work according to the HACCP-system (Hazard Analysis Critical Control Point). HACCP is an internationally recognized control system developed by NASA and is used in food production to eliminate risk during food manufacturing (*Mårdén, 1995*).

As previously stated, one of the readily available Ready To Eat food is bread, which is a staple food that do not require further processing before consumption. It is produced in various forms and eaten in homes, restaurant and hotels in Nigeria (*Emeje et al., 2010*). In addition, the consumption of bread cut across socio-cultural and religious barriers and is a food of choice for both rich and poor in Nigeria (*NAFDAC, 2010*). Bread is prized for its taste, aroma, quality, appearance and texture and, retaining its freshness is important to keeping it appetizing and appealing to consumers.

1.2 Problem statement

When food handlers do not practice safe personal hygiene, they may become vehicle for transmission of pathogens, through hands, mouth, skin and, other media. Street vendors are an important source of affordable food. But street foods often do not meet proper hygiene standards, in large part because of weak regulatory systems, inadequate food safety laws, lack of financial resources to invest in safer equipment, and lack of education for food-handlers. During the last decade, the baking industries have been passing through a tough phase of safety precautions. In addition, food (bakers) preparers may be sick with tuberculosis, typhoid, and other illnesses that can contaminate food. In this context, proper food safety within the bread supply chain (BSC) is vital to the Nigerian, as it directly impacts on their wellbeing and the economy in general. Good bread can be made from dough to which the adequate amount of yeast is added. The dough is then allowed to ferment and kept at desirable temperature for an appropriate period of time. Unfortunately, in most bakeries for accelerating the bread making process, recovering defects due to under-fermented dough as well as undesirable flour quality, there is no choice but to use chemicals such as soda, blankit (sodium hydrosulfite), extra salt for the reduction of gluten fluidity and increasing of dough elasticity. This practice, in turn, impairs health and is a cause of stomach trouble, malnutrition, increased blood pressure, allergies etc.

Therefore, the aim of the study was to assess the hygiene involved from the point of production to sale of bread.

The foregoing therefore raises the following research question as to;

- What is the nature of the bread supply chain?
- What are the food qualities issues in bread supply chain?
- Are there Food safety arrangements or guide in bread supply chain?

1.3 Objectives of the Study

The main objective of the study was to examine the food safety on Bread supply chain in Ekiti State Nigeria. The specific objectives are to;

- Describe the socio economical characteristics of respondents
- Examine the bread supply chain
- Identify potential food quality deterrents in bread supply chain.
- Examine food safety arrangement if any in the bread supply chain.
- Determine the level of compliance to standards in bread supply chain.

1.4 Justification of the Study

Few researches have been conducted on food safety on bread supply chain in the country; thus causing low level of awareness and enforcement In Nigeria, many rural and sub urban regions lack essential amenities and adequate enlightenment or sensitization on importance of food safety. Practices identified as contributing to foodborne outbreaks include improper refrigeration, prolonged handling and inadequate reheating of cooked food and contamination of food by commercial or household food handlers who worked while ill or had poor personal hygiene. A study like this is therefore timely as it examines food safety within the bread supply chain in Nigeria. Epidemiological data on food borne disease outbreaks in this community is not available but poor storage practices coupled with poor personal hygiene and lack of knowledge in food safety practices, which is peculiar with food handlers in Nigeria are causes of concern. It is important that consumers can take simple measures to reduce their risk of foodborne illnesses, especially in the home, hence this survey and its enlightenment potentials is aimed at assessing the food safety practices in bread and hygiene of household members of a rural community in Southwest, Nigeria and also giving proper orientation and sensitization according to the WHO

standard to promote food safety practices. Findings will help policy makers and implementers to enforce laws that will help to improve on sanitation and hygiene practices of bakers and sellers. The study also stands to educate food handlers on those inherent problems in the bread supply chain as well as create landmarks for staple food qualities.

1.5 Delimitation of the Study

The study focuses on sanitation and hygiene practices of bakers and bread sellers only. It did not cover other food producers and vendors in the local governments

1.6 Plan of the Study

The study comprise of five chapters. Chapter one deals with the introduction to the study. Chapter two presents a literature review of the research conducted on vended foods and bakery products. Chapter three describes the methodology to collect the data from the two communities. This chapter also includes the data analyses from the study. Chapter four represents the results and discussions of the research finding and chapter five talks about recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

In this chapter, related literature has been reviewed from books, journals, articles and internet sources. Literature is reviewed under the following topics:

- Food safety
- Regulations governing food vending in Nigeria.
- Food hygiene practices.
- Bread

2.1 Food Safety

Food safety is a broader term, which means an assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use. This can be achieved through the utilization of various resources and strategies to ensure that all types of foods are properly stored, prepared, and preserved so that they are safe for consumption (WHO, 2000).

Food can be defined as - edible substances whether in natural or manufactured state which, from a public health perspective form part of the human diet (Will & Guenther, 2007). Understanding the necessity of access to healthy and nutritionally sound foods is important for all. Diseases spread through food are common and persistent problems that result in appreciable morbidity and occasionally in death (Scharff, 2009; Tomohide, 2010). Food-borne illnesses have been described as one of the most widespread problems of the contemporary world (Wheelock, 2006) as it is an important and growing public health and economic problem in many countries.

Food safety has been defined as the conditions and measures that are necessary during the production, processing, storage, distribution and preparation of food to ensure that it is safe,

sound, wholesome and fit for human consumption (WHO, 1984). Food safety is a major concern with street foods as these foods are generally prepared and sold under unhygienic conditions, with limited access to safe water, sanitary services, or garbage disposal facilities (WHO-AFRO, 2006; Rheinländer, Olsen, Bakang, Takyi, Konradsen Sam & uelsen, 2008). An estimated 2.5 billion people patronize vended foods world-wide (Nyarango, Aloo, Kabiru & Nyanchongi, 2003). In Nigeria and elsewhere, food vendors are noted for selling foods and drinks at reduced prices, so providing more affordable means for people to obtain nutritionally balanced meals outside the home (FAO/WHO, 2003).

Food poisoning and other food borne diseases could occur where food and drinks are served or sold by food vendors or other food handlers (Seaman & Eves, 2006). Several factors are known to favour food borne disease or food poisoning during food handling processes. These factors include poor personal and environmental hygiene, poor storage of food and drinks, improper preparation and cooking, and carrier state with unclean hand (Seaman & Eves, 2006). The preventive steps to enhance food safety developed by the World Health Organization (WHO) are known as the “Golden rules” for safe food preparation. The rules include thorough cooking of food; thorough re-heating of stored food; avoiding contact between raw foods and cooked food; and protection of food from insects, rodents and other animals. Despite these “Golden rules,” food borne diseases continue to be a serious public health problem, especially in developing countries (WHO, 2006).

According to WHO (2006), the main source of food borne illness is through bacterial contamination, followed by physical factors (preparing and handling methods) and chemical usage. It is an undeniable fact that food borne illness cases cannot be eliminated thoroughly as it

is self-inflicted or accidentally caused by food operators and servers. Across the world, contamination of new bacteria and viruses are found in the food items received either dry or wet and cooked, their temperature should be below 50⁰C, while frozen items should be below 270⁰C. Other implementation of the principle of “first in, first out” (FIFO) system and discarding expired items has been stressed. The principle of “first in, first out” seeks to regulate the duration within which food items are persevered before they are consumed in order to ensure the maintenance of the needed nutrients. Fortification of micronutrients of foods therefore is fundamental to good health (WHO, 2006).

Food poisoning risks can be reduced through the implementation of FIFO system and the separation method of raw food and cooked food items. Long food holding time will increase the bacterial growth inside the food and cause food poisoning. Cooked food should be served and consumed within four hours and at a holding temperature of 63⁰C, which is highly recommended. On the other hand, chilled food should be held at the temperature of 5⁰C or less and -10⁰C and below for frozen food (WHO, 2006).

2.1.1 Food Safety Knowledge

Negative attitudes result in practicing harmful behavior (Bedworth & Bedworth, 1992) cited by Kalua, 2001). Knowledge is the ability to recall or recognize something such as a fact concept, principle or custom (Kalua, 2001). It is further stated that knowledge can be acquired through formal or informal settings either by the help of someone or alone. Knowledge is said to be a source of power necessary for everyone to make informed decisions about one’s health and participate actively in promoting health of the community (Kalua, 2001).

Food safety courses are administered worldwide as a means to inform food service workers on matters of food safety. Furthermore, data suggest that the food service industries are more likely to hire workers trained in food safety (Hine *et al.*, 2003). The expectation in providing these courses is ultimately to reduce the incidence of food-borne illness (Kassaet *al.*, 2010). However, there are conflicting results in the literature. For instance, Hammond *et al.*, 2005 found that critical food violations actually increased after training.

Furthermore, Ehriet *al.* (1997) suggest that there are no significant improvements after training on a number of critical concepts in food safety such as, food storage, cross-contamination, temperature control, and high risk foods. The authors further identify problems in training regimes that tend to rely merely on dissemination of information with no practical reinforcement. Powell *et al.*, (1997) determined that there was no relationship between the level of knowledge of staff and hygiene standards in restaurants. Cates *et al.* (2009), however, suggest that the presence of a certified kitchen manager is protective for the majority of critical food violations, and therefore employing and properly training such a manager is essential to ensuring a safe food product. Kneller and Bierma (1990); Mathias *et al.*, (1995) found that health inspection scores increased after food safety training, thereby implying the knowledge imparted from food safety training is sufficient in achieving higher inspection scores.

Knowledge regarding some of the key principles in preventing food-borne outbreaks, such as use of thermometers to verify safe internal food temperatures, is often overlooked and could potentially result in illness. For instance, Green *et al.* (2005) in their study of assessing food safety practices indicate that half of their respondents did not use a thermometer to properly

ensure safe internal food temperatures. As such, this imposes a critical concern regarding food safety.

Askarian *et al.* (2004) assessed knowledge, attitudes, and practices of food service staff on food hygiene in government and private hospitals in Iran. The study illustrated that staff comprehension, regarding pathogens that cause disease and the correct temperature for the storage of hot and cold foods, was limited. They further suggest that additional food safety courses and manuals be easily available for staff, however, the validity of such a comment has not been successfully proven (Askarian *et al.*, 2004). A similar study assessing food hygiene knowledge, attitudes, and practices in food businesses in Turkey revealed an immediate need for education and increasing awareness among food handlers on food safety practices (Bas *et al.*, 2006).

A study conducted in Italy by Angellilo (2000) and his associates examined foodservice staff in hospital environments. The results suggested a lack of knowledge regarding temperature of food storage of hot and cold foods, the identification of pathogens associated with foods, and common food vehicles that transmit pathogens (Angelillo *et al.*, 2000).

2.1.2 Translating Food Safety Knowledge into Practice

The provision of knowledge to change food safety attitudes and behaviors has not been adequately proven in the literature (Seaman & Eves, 2006). An effective food training course should not only provide food safety information, it should implement knowledge into practice for proper information retention. Campbell *et al.* (1998) suggests that implementation of a food safety training regime must target both managers and food service workers; furthermore the course must be active, such as a workshop. Food safety training courses are often administered

via computer-based programs, classroom-based seminars, or hands-on training (Seaman & Eves, 2006). Little research has confirmed the effectiveness of hands-on training delivered in the work environment. Rennie (1994) suggests that training programs that are more closely associated with the work site with practical reinforcement of hygiene messages are more effective than traditional methods of training. Practical in house, hands-on training tends to be the most favorable approach in relaying food safety messages (Hendry *et al.*, 1992).

Food safety training will lead to an improvement in food safety if the knowledge imparted reflects a positive change in behavior (Seaman & Eves, 2006). For instance, a manager of food service establishment in South Carolina that received food safety training was required to take an exam for evaluation purposes. Six months after passing the exam, an outbreak of salmonellosis, involving 135 confirmed cases and approximately 800 affected persons occurred in his establishment (Rennie, 1994). This suggests that the information was not translated into effective food safety practice thereby causing a substantial outbreak.

The majority of food safety courses rely solely on the dissemination of information with very little emphasis on practice which is ineffective (Egan *et al.*, 2007). They tend to adopt the Knowledge, Attitudes, and Practices (KAP) model which has substantial limitations (Griffith *et al.*, 2000). This model has become synonymous with health education and assumes an individual's behavior is dependent on their knowledge and the provision of information alone will lead to a direct change in attitude and thus behavior (Bas *et al.*, 2006). However, one such limitation to this model is that it assumes that people who are provided with food safety information will act upon the information gained (Ehiri *et al.*, 1997). Ehiri *et al.* (1997) in their study of evaluating a food hygiene training course in Scotland noted that after the training, there

was no significant improvement in course participants' pre-course knowledge of a number of crucial aspects of food safety, including food storage, cross contamination, temperature control, and high risk foods. This reflects poor training designs whose sole purpose is to comply with regulations and produce certified personnel. MacAuslan (2003) also suggests training in food safety relies too heavily upon attaining a certificate rather than paying attention to achieving competency in food hygiene practice (MacAuslan, 2003). This supported Clayton *et al.*, (2002) that behavioral changes in food safety will not occur as a result of training alone

2.1.3 Food Safety Culture

A relatively new emerging risk factor in the food industry is food safety culture Griffith *et al.*, (2010) propose a definition of food safety culture as the aggregation of the prevailing, relatively constant, learned, shared attitudes, values and beliefs contributing to the hygiene behaviors used within a particular food handling environment. Further studies investigating and understanding the underlying attitudes and beliefs may help to discover why and how to make a positive and balanced food safety culture at all levels. An organization's culture is ultimately its beliefs, attitudes and values that the employee is exposed to everyday (Griffith *et al.*, 2010).

2.1.4 Food Safety Challenges

Illness from food-borne pathogens is a significant global health concern (Rocourt *et al.*, 2003; WHO, 2002). Population level incidence estimates, however, are uncertain due to under reporting that there is difficulty in attributing illness to food consumption. In the U.S. the Centers for Disease Control estimate that contaminated food-borne pathogens cause approximately million illnesses, 325,000 hospitalizations, and 5,000 deaths among a population of 273 million each year (Mead *et al.* 1999). The World Health Organization believes incidence rates in OECD

countries are similar (Rocourt *et al.*, 2003). In developing countries, where it is more difficult to separate water and food-borne illness, approximately 2.2 million people die from these causes (Rocourt *et al.* 2003; WHO, 2002).

The World Health Organisation (WHO) regards illness due to contaminated food as one of the most widespread health problems in the contemporary world (Mukhola, 2000). Bekker (2003b) and McSwane, Rue & Linton (2000) define contamination as the presence of substances or conditions in the food that threatens the wholesomeness of food and can be harmful to humans. According to Käferstein *et al.*, (2000) biological contaminants, i.e. bacteria, viruses and parasites constitute the major cause of food borne diseases and food spoilage.

In 1996, the United States passed the first major pesticide legislation reform in thirty years, requiring evaluation of cumulative impact of low dose exposure to multiple chemicals on adult and child health and that standards be set to protect children (Hamilton & Crossley, 2004). The new European Chemical Regulatory Law, REACH (Registration, Evaluation, Authorization and Restriction of Chemical Substances), addresses similar concerns (European Council, 2006). The last three decades have also seen significant scientific transformation (Kinsey, 2001). New technologies, such as genetically modified foods and, more recently, nanotechnologies, often raise public concern and calls for new regulation. Consumer attitudes toward new technologies have differed considerably across countries, leading to differences in laws and the threat of trade disputes (Brom, 2004).

Globalization has brought many benefits to consumers, including more varied and nutritious food supplies throughout the year, but it has also complicated management of both infectious and noninfectious food-borne hazards. In developing countries, globalization has helped increase

incomes. Globalization has also fostered industrialization and urbanization, which can strain capacity for adequate sanitation and safe food handling (WHO, 2002). It can also lead to more rapid spread of food-borne disease. Poor sanitation in developing countries can result in contamination of food exports to developed countries, as happened in the 1996 *Cyclosporiasis* outbreak in the United States associated with Guatemalan raspberries (Calvin *et al.* 2003). But trade may also spread food-borne pathogens between developed countries, as in the spread of BSE from Britain to Japan in 2001, or from developed to developing countries (McCluskey *et al.*, 2005). Recent experience with economic adulteration of pet food, milk, and toothpaste from China demonstrates the need for the institutional capacity of industry and governments in emerging economies to grow with their productive capacity (Gale & Hu, 2009; Roth *et al.*, 2008).

Antle (2001) provides an excellent overview of theoretical literature on both supply and demand applicable to food safety economics. Supply and demand analysis is complicated by the fact that safety attributes are not usually directly observable by consumers, and often are either not observable to suppliers or observable by them only at a cost. Even where information relevant to product safety is available to one firm in the supply chain, there is a cost associated with communicating that information to downstream firms and consumers. Labeling and other information approaches to food safety policy are an attempt to deal with the resulting information asymmetries between consumers and suppliers. Traceability requirements, like those in the EU, are designed to address information asymmetry in the supply chain, increasing the speed of response to safety failures and helps strengthen market and liability incentives for precaution (Pouliot & Sumner, 2008). Firms may also invest in obscuring information about

product quality and safety by using colorants, additives, and processes that preserve attributes, such as meat color, that consumers look to as signals of safety.

The public health literature often uses Health Adjusted Life Year (HALY) measures as an alternative to either cost of illness or willingness to pay. These measures are widely accepted in Europe and used in the World Health Organization's Global Burden of Disease estimates (WHO, 2008). Their use in U.S. regulatory analysis was recently permitted by OMB under the Bush administration (U.S. OMB 2003). HALYs are indices of the impact of illness on physical well-being and function. They were developed to provide a common metric for the severity of health outcomes in evaluating the cost-effectiveness of alternative medical treatments. To be used in cost-benefit analysis, HALYs must be monetized. This has been controversial because HALY measures are not consistent with the utility theoretic foundations of welfare economics (Hammitt, 2002; Hammitt, 2003; Krupnick, 2004; Dickie & List, 2006). A recent U.S. National Research Council report recommended against monetizing HALYs (IOM 2006). HALYs measure discomfort associated with each year of life, they do not measure consumer preferences over reduction in risks of future health states. This leads to HALY measures placing greater weight on reducing chronic disease than to reducing mortality, particularly mortality in the elderly. In an empirical assessment of U.S. diesel fuel regulation, Hubbel (2006) shows that this conceptual difference between HALY and WTP metrics can change the outcome of regulatory analysis, particularly for policies involving more chronic disease than mortality. This could be of significance for food safety analysis comparing the benefits of interventions to reduce pathogens such as *Campylobacter*, which are associated with significant chronic morbidity and pathogens like *Toxoplasma gondii*, which has a higher mortality rate. It would be of even greater

importance in comparing the relative merits of reducing exposure to chemical residues and pathogens.

Empirical research estimating the benefits of food safety policy has used multiple methods including hedonic estimates of demand for safety from market data, stated reference surveys, and experimental auctions (Marks *et al.*, 2003; Shogren *et al.*, 1999). Antle (2001) and Golan *et al.* (2005) provide reviews of the empirical literature, focusing on the U.S. Many areas of applied economics is increasingly looking to meta-analysis, is a method of using statistical analysis to look at systematic patterns across related studies, to derive valuation estimates for use in policy analysis (Nelson & Kennedy, 2009; Bergstrom and Taylor 2006). Florax *et al.* (2005) conducted a meta-analysis of research on willingness to pay reduce health risks from pesticide exposure through food and other pathways.

Lusk *et al.* (2005) conducted a meta-analysis consumer willingness to pay to avoid genetically modified foods. A recent U.S. study looks at the sensitivity of willingness to pay for avoiding food-borne illness to duration and severity of illness (Hammit & Haniger, 2007). These reviews all have a U.S. focus. European valuation studies have been published related to BSE (Latouche *et al.*, 1998), GM foods in Italy (Boccaletti & Moro, 2000), organic foods in Denmark (Weir *et al.*, 2002), and *Salmonella* in chicken (Sundström & Andersson, 2009). Mørkbak *et al.* (2008) provide a comprehensive review of stated preference studies of meat safety and quality. However, food illnesses are defined as diseases, usually either infectious or toxic in nature caused by agents that enter the body through the ingestion of food (WHO, 2007).

Every person has a risk of food illnesses, but may vary in terms of risk level either low or high. Those who have little knowledge on food safety have high tendency to contracting food borne

illnesses. The entire world statistics on food borne outbreak showed that the cases of food borne illnesses is increasing year by year. In United States, estimation for food borne disease may result in 76 million illnesses, 325,000 hospitalization and 5000 deaths each year (Mead, Stutsker, Dietz, McCaig, Brescp. Shapiro, Criffin & Tauxe, 1999) while in England and Wales, food borne diseases resulted in an estimated 1.3 million cases, 21, 000 hospitalizations and 500 deaths yearly (Adak, Long & Brien, 2002). Also in Malaysia, food borne diseases in 2009 were low which is 1.4 cases per 1,000,000 population, but in terms of food poisoning cases is increasing as proven by the indigence rate of 62.47 and 36.17 per 100,000 population in 2008 and 2009 respectively (MOH, 2009:2010). In a longitudinal study conducted in Nigeria, street foods accounted for 19-27% of food expenses and provided 134-417 kcal per day per person. Street food vending assures food security for low-income urban populations and provides a livelihood for a large number of workers who would otherwise be unable to establish a business. The benefits of this trade extend throughout the local economy as often vendors buy their ingredients locally. Various projects have shown that street food trade generates a large volume of businesses, involving large amounts of money and provides a competitive source of employment and income to millions of people. In a survey conducted in Accra, Nigeria, the street food sector was shown to employ over 60 000 people with an estimated turnover of US\$100 million (Tomlins, 2002).

Although it is difficult to determine the global incidence of food-borne diseases, the World Health Organization (WHO) estimated that in 2005 alone 1.8 million people died from diarrhea diseases; it is estimated that 30% of the population in industrialized countries suffer from food-borne diseases each year (WHO, 2007).

The preventive steps to enhance food safety developed by the World Health Organization (WHO) are known as the “Golden rules” for safe food preparation. The rules include thorough cooking of food; thorough re-heating of stored food; avoiding contact between raw foods and cooked food; and protection of food from insects, rodents and other animals. Despite these “Golden rules,” food borne diseases continue to be a serious public health problem, especially in developing countries (WHO, 2006).

2.2 Regulations Governing Food Vending in Nigeria

Food and Drugs Act

Section 4 of the Act which is on the standards of foods state, “Where a standard is prescribed under an enactment for food, a person who manufactures, labels, packages, sells or advertises food in a manner that the food is likely to be mistaken for food of the prescribed standard commits an offence.”

Section 5 of the Act on prohibition against sale of poor quality food states:

A person who sells to the prejudice of a purchaser a food which is not of the nature, substance or quality of the article demanded by the purchaser commits an offence.

It is not a defense to an offence under subsection (1) to plead that the purchaser was not prejudiced because the food was bought for analysis or for a purpose other than for consumption.

Section 7 of the Act is on sale of food under unsanitary conditions. It states:

A person who sells, prepares, packages, conveys, stores or displays for sale a food under unsanitary conditions commits an offence.

(1) Food shall be stored and conveyed in a manner that preserves its composition, quality and purity and minimizes the dissipation of its nutritive properties from climatic and any other deteriorating conditions.

2.3 Food Vendors and Hygiene Practices

Basic kitchen sanitation guidelines are an important component of any food safety strategy (Jevs'nik *et al.*, 2006a). Food elaborated with satisfactory hygienic standards is one of the essential conditions for promoting and preserving health, and inadequate control is one of the factors responsible for the occurrence of food-borne disease outbreaks (Oliveira *et al.*, 2003). Food sanitation begins with the purchase or acquisition of different food items and ends with the proper storage of leftovers for future use. One of the most important aspects of practicing food safety involves preventing foods from becoming contaminated. Making sure foods are stored properly goes a long way in avoiding any type of food contamination.

2.4 Food Hygiene

The word "Hygiene" is used to describe a system of sanitary principles for the preservation of health. Personal hygiene refers to the cleanliness of a person's body. The health of workers plays an important part in food sanitation. People are a potential source of microorganisms that cause illness to others. Food hygiene refers to all conditions and measures necessary to ensure the safety and suitability of food at all stages of the chain. Food hygiene is defined as a sanitary science which aims to produce food that is safe for the consumer; of good keeping quality and free from micro-organisms (Bekker, 2003b). South African Bureau of Standards (2001) noted that, food hygiene is concerned with the provision of food for human consumption with a minimal risk of contracting food poisoning, by exercising good production,

preparation, storage and serving of food by following good procedures. Such procedures refer to proper washing of dishes, work surfaces, waste disposal, insect, rodent and bird infestation control, cleanliness of the entire premises and transport vehicles, maintaining safe product temperature, proper separation of food and non food items (McSwane, Rue & Linton, 2000). Practicing food hygiene ensures that the food which we eat is clean, wholesome, nutritious and free harmful additives and dangerous organisms and involves everyone, particularly those who process or serve food (Bekker, 2003b).

2.4.1 Personal Cleanliness and Hygiene

The food handler can often be a major source of contamination. Therefore, the practicing of good personal hygiene is essential for those who handle foods and include:

- Maintaining good personal habits
- Knowing when and how to properly wash hands
- Wearing clean protective clothing
- Maintaining good health and reporting when sick to avoid spreading possible infections
- Practicing food hygiene knowledge and principles (McSwane, Rue & Linton, 2000).

2.4.1.1 Hand Washing

Approximately 25% of food contamination is attributable to improper hand washing (Marriot, 1999). Hands of food handlers should therefore be washed regularly with soap in clean potable water, especially before starting to handle food, after going to the toilet and after handling raw food, food waste or chemicals (Bekker, 2003b). In order to facilitate hand washing, adequate hand washing facilities should be placed such that it will encourage the washing of hands (Bekker, 2003b). Hands should be washed in basins, separate from dish wash sinks (McSwane,

Rue & Linton, 2000) and must be provided with hot and cold water, soap or detergent and a suitable hand drying device or paper sheet. The use of fabric 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 contamination rather than reduce it. Paper towel sheets should rather be provided as an alternative (McSwane, Rue & Linton, 2000).

2.4.1.2 Wearing Clean Protective Clothing

Protective clothing, including coat, head covering, footwear and sometimes trouser and gloves, shall be suitable, clean and neat (Kenya Food Drugs and Chemical Substances Act, Cap 254 of 1992; South African Health Act 63 of 1977, Regulation 918).

2.4.1.3 Health status

In most countries, local health codes prohibit employees having communicable diseases or those who are carriers of such diseases from preparing and handling foods or participating in activities that may result in contamination of food or food contact surfaces (South African Bureau of Standards, 2001). Therefore, medical examination of food handlers is mandatory and a legal requirement in terms of the Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992 and the Kenya Public Health Act, Cap 242 of 1986.

The World Health Organization' Ten Rules does however not recommend routine medical and microbiological examination of food handlers, but rather that food handlers suffering from an illness that includes symptoms such as jaundice, diarrhoea, vomiting, fever, sore throat, skin rash or skin lesions such as boils or cuts, report this to their supervisor before starting work

(www.med.osaka-u.ac.jp/doc/0157/whorules.html, 15 August 2004) so as to determine their suitability to work or be given off duty, hence prevent possible contamination of food.

2.4.1.4 Contaminated Equipment and Utensils

The source of an infecting organisms on food may be endogenous (that is, the source is the patient's own flora) or exogenous (Jarvis, 2004). In exogenous contamination, the source of food contamination includes the hospital staff or the inanimate environment within the hospital. Food may be contaminated by polluted water, insects e.g. flies, rodents and pets, unclean utensils, dust and dirt (Gudeta, 2007). Equipment and containers that come into contact with food should be designed to enable easy cleaning and disinfection. The materials used for making the equipment should not have a toxic effect on food. Adequate facilities should be made available for the different core functions in food handling. The working area within the production area should be maintained clean to prevent contamination. All sinks, dish washing machines and other equipment should be so constructed to be easily cleaned and to be kept in good repair (WHO, 2001).

Cross contamination is a very significant concept in food safety. Raw food, particularly meat, should be successfully separated, either physically or by time, from ready to eat and cooked foods, with transitional cleaning or disinfection where essential. Poorly cleaned utensils and equipment surfaces harbor and encourage the spread of pathogens. Equipment and utensils used in the hospitals (for example, aluminum plates) need to be cleaned with warm water and detergent followed by disinfection. Suitable cooking procedures and recommendations need be observed in order to prevent the growth of pathogens (WHO, 2002). Furthermore, if food is not chilled or frozen during storage; and heated to temperatures between 70 and 800 before

consumption, then there are high chances of growth and subsequent ingestion of pathogens. Sufficient natural or artificial lighting should be enhanced to enable operations in a hygienic manner. Moreover, adequate means of natural or mechanical ventilation should also be provided. Ventilation systems are made in a way not to allow for air circulation from contaminated areas to clean areas (WHO, 2001).

Food handlers should maintain a high level of personal cleanliness and wear suitable protective clothing, head gear and footwear. People involved in food handling should refrain from smoking, spitting, chewing and sneezing or coughing over unprotected food. Personal effects like jewellery, pins and other adornments should not be brought into food handling areas. A food handler implicated to be a carrier of a disease illness should neither be allowed to go into food handling areas or handle food. Food handlers should undergo full medical examinations and issued with a certificate before allowed handling food. Food hygiene training is basically significant to equip the handlers with the knowledge and skills to handle food safely. Regular appraisals of the effectiveness of training and instruction activities should be made together with periodic supervision to enforce adherence to hygienic procedures (WHO, 2001).

2.4.2 Food Sanitation

Proper sanitation practices are important in maintaining food safety. Lack of hygienic practices can contribute to outbreak of food borne illnesses. Food Sanitation means creating and maintaining hygiene and healthful conditions in the food preparation storing and serving areas. To sanitize means, to reduce the bacterial contamination of the area being treated to a safe level. This condition is considered to be superior to physically clean and slightly less desirable than sterile. To ensure that the environment and equipment not only have been

cleaned, but also are protected against microbial contamination, it is thus necessary to apply sanitation practices.

The importance of sanitation practices is to combat the proliferation and activity of food spoilage and food poisoning microorganisms. A major challenge of the sanitarian is to protect the production area and other involved areas from the microorganisms that can reduce the wholesomeness of foodstuffs. Waste management, maintenance and cleaning as well as pest control as sanitation practices are described below:

2.4.2.1 Food Quality Management

To ensure health sustainability, Food quality management has to be performed, which requires the application of quality assurance (QA) systems. To achieve an appropriate food quality management level the implementation of QA systems has to be adjusted to the different contexts of the organizations (*Anon., 2000; Diepstraten, 2000*). Bakery products are characterized by a restricted shelf life, heterogeneity of (raw) materials, and seasonal variability in product quality due to production and harvesting conditions. The production quality of bakery products is designed, controlled, assured and improved by food quality management, the level of which can differ among bakeries. For example, some bakeries always purchase the same raw materials from the same suppliers and do not extensively control their quality, whereas other bakeries always select and evaluate suppliers and raw materials by audits, receiving control and analyses. The quality of food is dependent on the product safety, i.e. the guarantee the producer gives to the consumer that the food is safe and will not cause any sickness or other harm. To ensure this, producers have to work according to the HACCP-system (*Hazard Analysis Critical Control*

Point). HACCP is an internationally recognized control system developed by NASA and is used in food production to eliminate risk during food manufacturing (*Mårdén, 1995*).

HACCP is integrated into quality management systems as a tool to discover and control factors and procedures that deviates from the quality in regard to food hygiene hazards.

According to Codex Alimentarius Basic Texts on Food hygiene the HACCP-system consist of 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.

These seven principles are the main objectives of HACCP which main purpose is to guarantee the production of safe food, free from microorganisms causing illness, allergens, foreign objects and health endangering substances (*Bergström & Hellqvist, 2004*). From 2006 HACCP is a requirement for all food producers due to the regulation (EC) 852/2004, article 5.

To improve quality management and to assure food production quality in the bakery sector, four QA systems are used:

- (1) the Hygiene code for bread and confectionery.
- (2) HACCP (Hazard Analysis Critical Control Points).
- (3) ISO 9000-series (International Organization for Standardization).

(4) BRC (British Retail Consortium). These systems focus on different aspects of a quality system (Dalen, 1996; Hoogland et al., 1998; Luning et al., 2002; Van Der Spiegel et al., 2003; 2004; 2005a).

2.4.2.2 Waste Management

Improper removal, storage and disposal of waste can result into contamination of food, equipment, potable water and may attract breeding of pests (South African Bureau of Standards, 2001). There should be designated containers with covers, if necessary, for collection of waste and garbage and for their temporary storage until disposal. These containers should be properly identified, and be made of durable, impervious material and maintained in a sanitary condition (Alli, 2004; South African Bureau of Standards, 2001).

2.4.2.3 Maintenance and Cleaning

The establishments and equipment shall be kept in an appropriate state of repair and Condition (National Board of Experts-HACCP, the Netherlands, 2002; South African Bureau of Standards, 2001). Accordingly, food handlers should prevent contamination of food, for example, from metal sharps, flaking plaster, debris and chemicals. It must however be done in such a way that it will avoid contamination of ingredients, products or packaging material, minimizing the risk of pest infestation and also permit effective cleaning before continuing with processing.

The necessary cleaning methods and materials will depend on the nature of the maintenance conducted. Cleaning chemicals should however be handled and used carefully and in accordance with manufacturers' instructions and stored, where necessary, separated from

food, in clearly identified containers to avoid the risk of contaminating food (World Health Organisation, 1997). Food grade detergents should be used in cleaning (Bekker, 2003b).

Cleaning of a food establishment is a fundamental and important part of the operations and entails the removal of bacteria as well as soluble that is salt, sugar and insoluble particles, that is, oil, food particles, grease, grimed matter, residues and dirt that maybe a source of contamination. Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992, regulation 13, Cleaning is normally done in different phases namely (Alli, 2004).

- Pre-clean: Removing excess soil by sweeping, wiping or pre-rinsing.
- Main clean: Loosening of the surface grease and dirt using a detergent.
- Rinse: Removal of loose dirt and detergent.
- Disinfection: Destroying bacteria/other organisms.
- Final rinse: Removal of disinfectant.
- Dry: Preferably natural by evaporating dry.

To provide for the different stages of cleaning it is advisable to draw up a cleaning programme that will provide for the HACCP programme (Alli, 2004; National Board of Experts-HACCP The Netherlands, 2002; South African Bureau of Standards, 2001).

- Ensuring that all parts of the establishment are appropriately clean, and shall include the cleaning of cleaning equipment. Therefore, adequate facilities and suitably designated, shall be provided for cleaning food utensils and equipment and shall have an adequate supply of hot and cold potable water.
- Specifying all areas, items of equipment and utensils to be cleaned.
- Specifying the responsibilities for particular tasks, including method and frequency of cleaning.

- Continual and effective monitoring for suitability and effectiveness Although cleaning chemicals is used as cleaning aids, water still remains the main cleaning agent and should therefore be potable, complying with standards as previously indicated. Cleaning chemicals shall be of the food grade type (Alli, 2004; Bekker, 2003b) and shall be stored, where necessary, separately from food, in clearly identified containers to avoid the risk of contamination of food (National Board of Experts-HACCP, The Netherlands, 2002).

2.4.2.4 Pest Control

The availability of food and water encourages pest harborage and infestation (Alli, 2004; World Health Organisation, 1997). It is further stated that good hygiene practices should be employed to avoid creating an environment conducive to pests. Good sanitation, inspection of incoming materials and good monitoring can minimize the likelihood of infestation and thereby limit the need for pesticides (Alli, 2004; World Health Organisation, 1997).

The benefits of proper cleaning and sanitizing of equipment and utensils, time and temperature controls and food handling can all be wasted if insects and rodents are allowed to contaminate foods and food contact surfaces. There is therefore a need for a pest control program in food establishments (McSwane, Rue & Linton, 2000, National Board of Experts-HACCP, the Netherlands, 2002).

Toilet facilities near work areas provide good personal hygiene, reduce lost productivity and permit closer supervision of employees (McSwane, Rue & Linton, 2000). Adequate, suitable and conveniently located change rooms, toilets and ablution facilities shall be provided at all food establishments (Alli, 2004).

2.5 Food Handling

Food handling is defined as manufacturing, processing, producing, packing, Preparing, keeping, offering, storing, transporting or displaying for sale or for serving (South African National Health Act 63 of 1977, Regulation 918 of 1999). Increased handling of food is responsible for a more complicated and critical challenge of protecting food from contamination (Marriott, 1999). Good hygiene practice in food preparation and service plays an important role in ensuring food safety. This is achieved by following general rules of good food hygiene and other approaches like HACCP (www.med.osaka-u.ac.jp/doc/0157/who_rules.htm: 15 August 2003). Poor hygienic practices can contribute to outbreaks of food borne illnesses. It is therefore important that the food establishment management / owner provide methods and means of handling that prevent damage to or deterioration or contamination of any food product (South African Bureau of Standards, 2001).

2.5.1 Purchasing

Bekker (2003) and McSwane, Rue and Linton (2000) argue that for a sanitation program to be effective, it should start with a sound food supply. The person entrusted with purchasing, should therefore buy the product that is best suited for the job, buy the proper quantity of the item, pay the right price for the item, buy from only reputable and dependable suppliers and should have knowledge of products and market conditions. Food is purchased from local market, butcheries, farmers, and suppliers.

2.5.2 Receiving

Personnel responsible for receiving products must carefully inspect all incoming food supplies to make sure they are in sound condition, free from filth, spoilage, damage, insect infestation and at

proper temperatures. Deliveries that do not go for immediate use should be stored at once in an appropriate storage area. Foods that are damaged, for example, dented cans should be rejected (Bekker, 2003b; McSwane, Rue & Linton, 2000; National Board of Experts-HACCP, The Netherlands, 2002).

2.5.3 Storage

All foodstuffs undergo unwanted changes during storage if not kept under proper conditions (Heijden *et al.*, 1999). Cool refrigeration, frozen and dry storage are among the methods of food preservation. Cool storage refers to storage at temperatures above freezing, from about 16°C down to -20°C while frozen refers to storage at temperatures - 18°C or below to maintain food (Potter & Hotchkiss,1998).

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. The perishable foods are obtained on daily bases for use.

2.5.3.1 General Storage Rules

The following general rules should be followed when storing food (Bekker, 2003; McSwane, Rue & Linton, 2000):

- Cooked foods should be kept well separated from raw food and covered to reduce the risk of cross-contamination.
- Food should be kept off the floor and away from walls.
- First-in-first-out (FIFO) system stock rotation should be implemented.
- Arrangement of items in stores should be well done and coded/marked for ease of identification and removal and for use.

- All food should be stored in an orderly fashion so as to facilitate ventilation and assessment of food to detect deterioration.
- 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.

2.5.4 Cooking

Proper cooking of potentially hazardous foods destroys harmful micro-organisms that may be present in the food (McSwane, Rue & Linton, and 2000). 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°to 74°C (McSwane, Rue & Linton, 2000) but it is recommended that the core temperature of all parts of the food must reach at least 70°C within a period of 2hours (Frazier & Westhoff, 1988). The Department of Health, 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 (www.med.osaka-u.ac.jp/doc/0157/whorules.htm l, 15 August 2004) 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. However, reasonably rapid thawing is recommended to prevent the possible growth of micro-organisms.

2.5.5 Cooling

Cooling refers to the removal of heat energy. 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°C within 2 hours and from 21° to 5°C within an additional 4 hours (McSwane, Rue & Linton , 2000). When dishes containing a mixture of cooked and raw ingredients e.g. salads are being prepared, it is important to cool the cooked component before mixing with the other ingredients (www.med.osaka-u.ac.jp/doc/0157/whorules.htm, 15 August 2003).

2.5.6 Holding of Food

Holding of food implies keeping or retention of semi-finished or finished food for a period of time under specified temperatures (www.brainydictionary.com/words/ho/holding173887.html, 9 May 2005; www.cogci.princeton.edu/cgi-bin/webwn, 9 May2005) and may be done during cooking, cooling, reheating and food preparation. During these activities, the amount of time foods is 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.

2.5.7 Serving of Food

Food should be handled, served or sold with clean equipment and utensils i.e. tongs, forks, spoons or disposable gloves and never handled with bare hands (Department of Health, South Africa, 1997:67). Utensils/cutlery should be clean and dry and not handled by touching the food contact surfaces (McSwane, Rue & Linton , 2000).

2.6 Food Handlers/Visitors

A food handler is defined as anyone who is engaged in any of the processes which make up or are ancillary to food processing (for examples; a cook, a wash-up, waitress) even though they might not handle food directly) (Alli, 2004; National Board of Experts, the Netherlands, 2002).

2.6.1 Personal Habits/Behavior

Persons working in direct contact with food should wear clean outer garments and conform to hygienic practices while on duty; they shall wash their hands thoroughly, remove jewellery, and take any other necessary precautions, for example, bathing, washing and restraining hair; keeping finger nails short and clean; washing hands after using toilet to prevent contamination of food with micro-organisms or foreign substances (Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992; South African Bureau of Standards, 2001:27; South African Act 63 of 1977, Regulation 918).

Activities that encourage hand/mouth contact such as smoking or the chewing of gum, tobacco, betel nut or finger nails can also therefore lead to food contamination and must be avoided. The same also applies to the tasting of food during preparation. Similarly food handlers should not spit, sneezes or cough over food, or pick their nose, ears or any other parts of the body (www.med.osaka-u.ac.jp/doc/0157/whorules.html, 15 August 2004; McSwane, Rue & Linton,2000; Kenya Food Drugs and Chemical Substances Act, Cap 254 of 1992; South African Health Act 63 of 1977, Regulation 918).

2.6.2 Wearing Clean Protective Clothing

Protective clothing, including coat, head covering, foot wear and sometimes trouser and gloves, shall be suitable, clean and neat (Kenya Food Drugs and Chemical Substances Act, Cap 254 of 1992; South African Health Act 63 of 1977, Regulation 918).

2.6.3 Health Status

In most countries, local health codes prohibit employees having communicable diseases or those who are carriers of such diseases from preparing and handling foods or participating in activities that may result in contamination of food or food contact surfaces (South African Bureau of Standards, 2001). Therefore, medical examination of food handlers is mandatory and a legal requirement in terms of the Kenya Food, Drugs and Chemical Substances Act, Cap 254 of 1992 and the Kenya Public Health Act, Cap 242 of 1986.

The World Health Organization' Ten Rules does however not recommend routine medical and microbiological examination of food handlers, but rather that food handlers suffering from an illness that includes symptoms such as jaundice, diarrhoea, vomiting, fever, sore throat, skin rash or skin lesions such as boils or cuts, report this to their supervisor before starting work (www.med.osaka-u.ac.jp/doc/0157/whorules.html, 15 August 2004) as to determine their suitability to work or be given off duty, hence prevent possible contamination of food. Food handlers should only be subjected to the same health standards used in screening prospective employees.

Further, supervisors should observe employees daily for infected cuts, boils and respiratory complications and food handlers should take personal initiative and be the custodian

of their own health and see to it that they go for medical checkup whenever they feel unwell.

(a) General Practices

- Personal hygiene practices and responsibilities about their health that all food handlers preparing food know and put into practice.
- Food handling practices to prepare and store food correctly.
- Hygiene practices to keep the food premises and equipment clean and well maintained

For example, these rules may require food handlers to know how to assess and judge unsafe food when being delivered to the business.

(b) Specific Practices

Skills and knowledge needed for more specific food handling operations, such as receiving food into premises, cooking, reheating and cooling food, controlling the time food is at room temperature and disposing of food (Australia / New Zealand, 2002). For example, checking temperature would need knowledge of which foods are potentially hazardous and therefore need to be checked; the proportion of the foods to be checked for each delivery; what the correct temperatures are and what to do if the food is not at the correct temperature. The food handler would also need skills to take accurate temperatures of potentially hazardous foods using a temperature probe.

The health belief model, posits that individuals must perceive themselves to be at risk of the health threat before they will take actions to reduce risky behaviors or to engage in healthy alternative behaviors (Uwalaka & Matsuo, 2002). Spradley, (1990) indicates that to be most effective in reducing the incidence of food borne illness, it is important that the health issues of concern are identified and that the subsequent educational messages promoted to consumers

and food handlers address the factors that lead to the highest incidence of food borne illness and most serious consequences. Finally, knowledge becomes meaningful and useful when the learner has comprehended and applied the acquired knowledge and skills appropriately.

A major challenge of the sanitarian is to protect the production area and other involved areas from the microorganisms that can reduce the wholesomeness of foodstuffs. Contaminated foods can cause several illnesses including respiratory diseases e.g. Cold, sore throats, Pneumonia, and tuberculosis, gastrointestinal diseases, vomiting, diarrhea, dysentery, typhoid fever and infectious Hepatitis. Even if a food handler does not feel sick, he or she can still be carrying microorganisms on their body or clothes that can cause illness if they get into food. Hence, such as the common cold, sore throat, Pneumonia, scarlet fever, tuberculosis and trench mouth. The food handler can often be a major source of contamination. Therefore, the practicing of good personal hygiene is essential for those who handle foods and include (McSwane, Rue & Linton, 2000).

Interestingly, cases of consumption of unhealthy foods are becoming more severe, not only complicating public health, but more worrying is the increase among children. One of the most important aspects of practicing food safety involves preventing foods from becoming contaminated. Making sure foods are stored properly goes a long way in avoiding any type of food contamination (McSwane, Rue & Linton, 2000).

2.7 Bread

Bread is a staple food prepared by baking a dough of flour and water. Flour provides the structure for baked products.

2.7.1 History of Bread

Man learned the art of bread making more than 4000 years ago. Though not always in the same form or as we know it today, bread has been a popular staple food for ages. All countries and cultures have some form of bread. Bread is the world's most widely eaten food and has been a main part of the human diet since prehistoric time. Bread making began very simply by grinding some kind of grains into flour adding liquid to the flour and baking the dough on hot rocks. Bread making today can be a more involved process and many include eggs, leavening agents such as yeast or baking powder and flavouring for hundreds delicious variations (Project Food, Land and People, 2008). Bread products vary widely around the world, as do their production techniques. Basic ingredients are cereal flour, water, yeast or another leaving agent, and salt (Sluimer, 2005).

2.7.2 Nutritive value of Bread

Bread is an essential food in human nutrition. It is a good source of energy and contains groups of Vitamin B, proteins and minerals which are essential in our diet (Ms Al-Mussali *et al*, 2007). The chemical content of balady and pan bread made of whole wheat flour and with flour of 72% extraction rate. They concluded in their results that babady bread contains moisture (33-34%) fat (2.53-2.55%) fibre (3.62-3.93%), ash (2.63-2.98%) and carbohydrates (78.65-78-74%). Balady bread is produced from whole wheat flour (Al-Mussali *et al*, 2007).

Al-Kanhal *et al* (1999) studied the nutritive value of various bread Saudi Arabia such as Mafroud, Samouli (French type bread) and white bread commonly consumed over the world they concluded that these type of bread had protei

n, fat and fibre. The high starch content as energy source cereals also provide dietary fibre (high in protein and glutamine, but low in lysine) and functional lipids rich in essential fatty acids (Kloffenstein, 2000).

2.7.3 Ingredients for making Bread

Flour, yeast, water, fat, eggs and salt are used in making bread. Flour provides the structure for baked products involving pastry or dough. This is made possible by the gluten (protein) in the flour. It forms the main structure or the bulk of the product (Adow *et al*, 1991).

Fat includes lard, butter, cooking oil and vegetable oil. Fat adds flavour and helps to brown the crust of the baked product. Fat makes baked products rich and tender and keeps baked products from getting dry.

According to Adigbo *et al* (2011) sugar improves texture, crispness and helps brown the crust of the baked product. Apart from making flour products sweet, it also helps to make the product soft and tender so as to make the product rise in the oven (Adjadji, 1998). Sugar is the source of fermentable carbohydrates for yeast and it also provides sweet taste. Liquid helps to bind flour and the other ingredients in the recipe and produces steam during baking and therefore helps raise the products and gelatinizes the starch and develop the gluten (Adigbo *et al*, 2011).

Leavening agents or raising agents in baked products means adding in bulk to the basic mixture that is to be used for the products and also making the mixture light enough so that the finished products may feel soft and crumbly (Adjadji, 1998). Raising agents are used to raise product in the oven during cooking.

Salt in bread enhance flavour of all other ingredients and adds taste to the bread. It also strengthens the gluten network in the dough, (Ceserani *et al.*, 2009). The absent of salt make bread bland.

2.7.4 Use of potassium in bread making

Potassium bromate (KBrO₃), is a bromate of potassium and takes the form of white crystals or powder. It is typically used as a flour improver (E number E924), strengthening the dough and allowing higher rising. It is an oxidizing agent, and under the right conditions, will be completely used up in the **baking bread**. However, if too much is added, or if the bread is not baked long enough or not at a high enough temperature, then a residual amount will remain, which may be harmful if consumed. Potassium bromate might also be used in the production of malt barley where the U.S. Food and Drug Administration (FDA) has prescribed certain conditions where it may be used safely, which includes labeling standards for the finished malt barley product. It is a very powerful oxidizer ($E^\circ = 1.5$ volts comparable to potassium permanganate). Bromate is considered a category 2B (possibly carcinogenic to humans) carcinogen by the International Agency for Research on Cancer (IARC) Bans. Potassium bromate has been banned from use in food products in Europe, as well as the United Kingdom in 1990, and Canada in 1994, and most other countries. It was banned in Sri Lanka in 2001 and China in 2005. It is also banned in Nigeria, Braziland, Peru. In the United States, it has not been banned. The FDA sanctioned the use of bromate before the Delaney clause of the Food, Drug, and Cosmetic Act went into effect in 1958 which bans carcinogenic substances so that it is more difficult for it to now be banned.

(Source Wikipedia)

2.7.5 Shelf-life of Bread

The average shelf life of bread is 3-5 days but if the hygiene and sanitation of the bakery is poor the shelf life of bread especially some wheat bread can be shorter.

One of the main causes of bread spoilage is bread staling. This phenomenon has been studied for many years and the results indicate that the main reasons for bread staling are starch-gluten cross-linkages and water migration from bread crumb to its crust (Martin *et al*, 1991; Martin & Hosenev, 1991; Hosenev, 1994; Gray & Bemiller, 2003). To delay bread staling and increase bread shelf-life, different bread additives and technological methods have been applied (Rogers *et al*, 1988; Hosenev, 1994). One of the possible methods is to use frozen storage. This method is an appropriate method for long-term storage of bread (e.g. 3-4 weeks). Freezing converts the water in the bread into a non active compound and this along with the low temperature retard microorganism growth and prevent chemical and enzymatic deterioration of bread, (Barcenav & Rosell, 2006).

Another technique to increase the shelf-life of bread is part-baking. Part baked bread which is also called interrupted or part-baked bread has been introduced in which the bread is partially baked so that baking is just interrupted before formation of crust colour, i.e. before Millard and caramelization creations (Vulicevic *et al.*, 2004; Barcenav and Rosell, 2006). The part-baked bread is then packaged and can be kept at ambient temperature for several days or chilled and frozen for long storage before full-baking by consumers.

2.7.6 Bread making regulation guidelines in Nigeria

In Nigeria, commercial bread making is regulated by guidelines, through the National Agency for Food and Drug Administration and Control (NAFDAC), through the 4-point safety standards that bread bakers should comply with in Nigeria, as follows:

- Consistent' production of flour fortified with Vitamins A& and C and other " safe enhancers in approved quantities to prevent bakers from adding dangerous chemicals like potassium bromate as flour/bread improvers,
- Compliance with set standards of Good Manufacturing Practice (GMP) and Hazard Analysis Critical Control Points (HACCP) guidelines and requirements of the Agency,
- Stop the use of dangerous ingredients which are not on the list of substances generally regarded as "safe" and
- Bakers should stop the habit of distributing loaves of bread to consumers without proper packaging and in unhygienic conditions (NAFDAC, 2010).

2.8 Consumer perception and attitude towards bread

Consumers perceive bread as a basic and traditional food product. Furthermore bread is perceived as being important in a balanced diet, because of the nutritional quality of its fibres, minerals and vitamins content. In addition, bread is considered as a suitable energy source, contributing to a higher saturation grade. However, also negative attributes are associated with bread consumption related to price, monotony, unattractiveness, short shelf-life, and decreased perceived experience and credence quality, in particular in connection with an increased industrial production of bread.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter presents the methodology used for the study. It covers the research design, atusy location, population, sample size and sampling technique, instrumentation, procedure for data collection, data analysis and scope of study.

3.2 Research Design

Babbie and Mouton (2004) describe research design as a plan or structure for an investigation or a list of specifications and procedures for conducting a research project. The researcher employed a descriptive cross-sectional survey design for this study. Descriptive research design is concerned with describing characteristics of a problem. According to Amedahe and Gyimah (2004), descriptive survey is a design which describes the present status of a phenomenon. This means that, it is concerned with the conditions or the relationships that exist such as determining the nature of prevailing conditions, practices and attitudes; opinions that are held; processes that are going on; or trends that are developed. Descriptive design helps portray an accurate profile of persons, events and situations. The purpose of employing the descriptive method was to describe the nature of a condition, as it takes place during the time of the study and to explore the cause or causes of a particular condition. The researcher adopted the descriptive design because it is one of the most convenient and reliable research designs for such a study. In the view of the researcher, the method (design) is indicative of prevailing conditions.

A cross-sectional design is the process of collecting data in a specific period (Creswell, 2003).Ghauri and Gronhaug (2005) define descriptive cross-sectional survey method as one

which looks with intense accuracy at the phenomena of the moment and then describes precisely what the researcher sees. Descriptive research of cross-sectional survey type was used to enable the researcher provide assessment of the food hygiene and sanitation knowledge, practices and attitudes among the bread bakers/sellers.

3.3 Study Location

The study was carried out in Ekiti State, a semi-urban city in Nigeria. Ekiti is a state in western Nigeria, declared a state on 1 October 1996 alongside five others by the military under the dictatorship of General Sani Abacha. It has an area of 321 km² and a population of 59,104. The postal code of the area is 370. The city is inhabited by 198,990 people, comprising male 89,650 and 78,801 females (NPC, 03-21-2011).

The State is mainly an upland zone, rising over 250 meters above sea level. It lies on an area underlain by metamorphic rock. The State enjoys tropical climate with two distinct seasons. These are the rainy season (April–October) and the dry season (November–March). Temperature ranges between 21° and 28 °C with high humidity. Ekiti consists of 16 local government. Ekiti has borders with Ondo state, Osun state, Edo state, Kwara state.

3.3 Population

According to Sugiyono (2011), a population is set or collection of all elements possessing one or more attributes of interest. Population refers to any collection of specified group of human beings or non-human entities (Koul, 2002). The population involved in this study consisted of bakers and bread sellers in the various local governments in Ekiti-State.

3.4 Sample Size, Sampling Techniques and Procedures

Sampling is an important aspect of data collection (Rao, 2008). It is that part of statistical practice concerned with the selection of an unbiased or random subset of individual observations within a population of individuals intended to yield some knowledge about the population of concern, especially for the purposes of making predictions based on statistical inference (Leedy & Ormrod, 2005). A sample is a small subset of a larger population whose selection is based on the knowledge of the elements of a population and the research purpose (Babbie, 2004). The simple random and convenience sampling techniques were used in selecting 32 bread bakers and 96 bread sellers for this study.

Random selection of bakery operators (32) and bread retailers (96) was based on the sampling frames for bakeries and bread consumers respectively. The random selection ensured that each baker and bread seller had an equal chance of being selected. "This is required for generalisation of the results to the target population" (Creswell, 2009). To ensure voluntary participation, any sampled respondent who declined to be studied was replaced by conveniently selecting a substitute bread baker or seller. The convenience sampling was used to ensure proximity and ease of access to respondents and information. In all, 128 study participants were enrolled in the study.

3.5 Instrumentation

Two techniques were used during data collection. These are administration of questionnaire and observation. Multiple instruments were used in data collection are: questionnaire, observation guide (checklist), photo in addition to documentary analysis. This was done to ensure

triangulation of data as noted by Punch (2003) and cross-checking data from multiple sources to search for regularities in the research data (Berg, 2007).

3.5.1 Questionnaire

The questionnaire mainly contained close ended and a few open ended items. The close ended items mainly contained a Likert-scale type questions/statements which were built on a five-point scale rating: Very Great Extent (**VGE**) = 4; Great Extent (**GE**) =3; Some Extent (**SE**) =2; Very Little Extent (**VLE**) =1; Not at all (**N**) = 0. The questionnaire was designed for the respondents to reflect on the key themes raised in the research questions.

3.5.2 Observation Schedule/Checklist

A semi-structured observation guide was designed to collect data. The observation involved interaction and physical examination or inspection of bread bakers and sellers as well as the work environment and facilities/equipment.

Table 1: Data Analysis

Objectives	Meaning	Data requirement	Analytical tool
Identify the socio economical characteristics of the respondents	To the bio datas of the the respondents (Bakers and Bread sellers)	Age, Gender, Education, no of years of experience, Scale of Production e.t.c	Descriptive statistics
Examine the bread supply chain	To know the level of distribution between the agents involve in production	Sources of output, sources of transport, market channel used by the bakers	Descriptive statistics
Identify potential food quality deterrents in bread supply chain.	To evaluate the causes and level accelerating staling therefore reducing palatability	Method and types of preservation, ingredient use in bread, hygienic practices involved.	Descriptive statistics
Examine food safety arrangement if any in the bread supply chain.	To know if food safety practices are organized in the various settings	Sourced data based on foreign standards applied to bakeries	Descriptive statistics
Determine the level of compliance to standards in bread supply chain.	To know the level of how each channels conforms to using standards in production	Equipment's used, ingredients used, methods of preservation, packaging types	Descriptive statistics and linear regression
Evaluate the constraints to food quality practices in bread supply chain.	To show the reason for not adopting proper practices	Awareness, Production cost, transport cost, preservation cost	Descriptive statistics

Field Survey, 2017

In the questionnaire data analysis, responses made by the respondents to each set of items were sorted out. The quantitative data was analysed descriptively using frequency counts, percentages. The data was coded, edited and entered into the Statistical Package for Social Sciences (SPSS version 21) for onward analysis. The SPSS data analysis commands and menus were employed to generate the frequency counts and percentages of responses according to each research question. The data is presented as frequency counts and average count. The average frequency counts were interpreted as below: 0.0 - 0.99 = very low level; 1.0 - 1.99 = low level; 2.0 – 2.99 = marginal/satisfactory or moderate level; 3.0 - 3.99 = high level; and 4.0 –4.99 = very high level. The qualitative data was categorized into themes, and presented in narratives with direct quotations. The results of the data analysis were presented in tables, figures or charts and photographs.

3.7 Scope of the Study

This study covers the following local governments; IKOLE, IJERO, OYE, IKERE, ADO, OMUO (Ekiti east), IREPODUN AND OTUN in Ekiti-State.

CHAPTER FOUR

Table 2: Socio-economic Characteristics of Bread Bakers and Bread Sellers in Ekiti State communities (nB = 32; nBS = 96)

		Bread bakers		bread sellers	
		Freq	%	Freq	%
Gender	Male	21	66.0	3	3.0
	Female	11	34.0	93	97.0
Age (age group)	13-25	6	19.0	18	18.0
	26-49	19	59.0	40	43.0
	50-above	7	22.0	38	39.0
Marital status	Single	11	35.0	20	21.0
	Married	17	53.0	42	44.0
	Widowed	3	9.0	18	19.0
	Separated	1	3.0	14	16.0
Level of Education	None	2	4.0	21	22.0
	Primary	8	26.0	24	24.0
	Secondary	11	37.0	36	38.0
	Professional cert.	4	13.0	11	12.0
	OND	5	16.0	0	0.0
	HND	0	0.0	0	0.0
	B.S.C	0	0.0	0	0.0
	Adult Education	2	4.0	4	4.0
Primary occupation	Farming	1	3.0	8	9.0
	Civil servant	3	9.0	2	2.0
	Contractor	0	0.0	0	0.0
	Trading	4	13.0	69	71.0
	Bakery	22	69.0	4	5.0
	Others	2	6.0	13	13.0
No. of yrs in bread baking/ vending industry	Below 5	12	39.0	22	23.0
	5-10	18	56.0	42	43.0
	10-15	2	5.0	19	20.0
	Above 16	0	0.0	13	14.0
Description of the type of bread baking/vending biz	Small scale	18	56.0	69	72.0
	Medium scale	11	34.0	20	21.0
	Large scale	3	10.0	7	7.0

Source: field survey 2017.

Table 2 shows that, out of the total sample of 128 respondents, only 34% were males and 66% were female respondents. 34% of the bread bakers were female while 66 were males, 3% of bread sellers were males and 97 females. Thus, there were more males than females in the bread baking and vice versa in bread selling business.

From Table 4.1, 19% of the bakers and 18% of the bread sellers were within the age range of 13-25 years whereas, 59% of the bakers and 43% of the bread sellers were between 26 and 49 years of age. Also, 22% of bakers and 39% of bread sellers were in the range 50 years and above. , the overall result shows that majority of those engaging in bread business are in their economically active years.

With respect to education, 6% of bakers and 22% of bread sellers have no formal education (illiterates); 25% of bakers and 24% of bread sellers had primary education and 36% of bakers and 38% of bread sellers had secondary education; 13% of bakers and 12% of bread sellers had professional certificate on education of learned jobs such as hairdressing, aluminum, tailoring etc. 16% of bakers had OND and none for bread sellers. Adult education for bakers was 4% and 4% for bread sellers. A significant number more than 50.0% of the respondents had low level of education. Knowledge is the ability to recall or recognize something such as a fact concept, principle or custom (Kalua, 2001). It is further stated that knowledge can be acquired through formal or informal settings either by the help of someone or alone. Knowledge is said to be a source of power necessary for everyone to make informed decisions about one's health and participate actively in promoting health of the community (Kalua, 2001). It is therefore necessary for bread bakers and sellers to acquire some form of education either formal or informal way to enable them handle food in a better way.

On the experience of the respondents in bread baking/vending business, 39% of bakers and 22.8% of bread sellers had less than 5 years of experience in the industry; 56% of bakers and 43% of bread sellers had 5 to 10 years of experience; 6% of bakers and 21% of bread sellers had 11 to 15 years while, none of bakers and 134% of bread sellers had 16 years of experience or more in the industry. It could be concluded that only few (6% to 34%) of the respondents were relatively experienced in bread baking, and bread selling because of long years in the industry. This means that, both bread sellers and bakers need to get some form of training to make them more skillful and experience to handle issues relating to hygiene, sanitation and food contamination better in the baking industry.

On the description of the type of bread baking/vending business which is operated by the respondents, the majority 65% of bakers and 73% of bread sellers operated small-scale ventures. This was followed by medium-scale bread baking/vending business bakers which is 26%; bread sellers 21. Only 10% of bakers and 7% of bread sellers operated large-scale type of venture in more populated environment such as Ado-ekiti and ikere-Ekiti in Ekiti State.

4.2 BREAD SUPPLY CHAIN OF THE RESPONDENTS

Table 3: respondent based on sale channels (nBS = 96)

L.G.A	SHOP	KIOSK	HAWK	Motor	Others
IKOLE	9	3	0	0	0
IJERO	7	4	0	1	0
OYE-EKITI	8	1	1	0	2
IKERE	9	3	0	0	0
ADO-EKITI	8	2	1	0	1
OMUO	7	3	1	1	0
IREPODUN	10	1	0	1	0
OTUN	8	4	0	0	0
Percentage	68.75	21.87	3.1	3.1	3.1

Source: field survey 2017.

The table shows that majority of bread retailers sell their bread products from shop 68.75% and kiosk is 21.87%, cars and hawk, motors and others are 3.1%. Most kiosks are found at garages, parks, public settings etc. where unsanitary drainages are common. They are separated from residential buildings unlike the shop which is close and within most residential areas. The sales channel depends majorly on the financial status of seller and consumer availability.

Table 4: Bakers Mode of Transport (nB = 32)

L.G.A	Car	Truck	Bus	Bike	Others
IKOLE	2	0	2	0	0
IJERO	2	0	1	1	0
OYE-EKITI	1	0	3	0	0
IKERE	1	0	3	0	0
ADO-EKITI	2	1	1	0	0
OMUO	2	0	2	0	0
IREPODUN	1	0	2	1	0
OTUN	2	0	2	0	0
Percentage	40.6	3.1	50	6.25	0

Source: field survey 2017.

Majority of bakers (50%) use bus to convey their product to the vendors and hawkers, which is the average of transport media used. Close to it is the car transport of conveying bread at about 40.6%. The car is mostly used by small scale producers to market a limited number of bread.

And most of the car transporters are within a specified area cover. The truck has about 3.1% mostly used in semi-urban areas with larger bakery facilities with more production. The truck is more presentable in hygienic practice as it has enough well laid space for bread transport and less damage to packaged bread but there is less utilization of truck because of the rural diversity economy in Ekiti state. Bike is 6.25% level; it includes tricycle, motor bike.

Table 5: Daily flour consumption by bakeries across Ekiti local governments (nB= 32)

L.G.A	Bakery A			Bakery B			Bakery C			Bakery D			Total		
	Max daily consume			Max daily consume			Max daily consume			Max daily consume					
	Less than 2 sacks	3-5 sacks	5 AND ABOVE	Less than 2 sacks	3-5 sacks	5 AND ABOVE	Less than 2 sacks	3-5 sacks	5 AND ABOVE	Less than 2 sacks	3-5 sacks	5 AND ABOVE	Less than 2 sacks	3-5 sacks	5 AND ABOVE
IKOLE		√		√			√				√		3	1	0
IJERO	√				√		√			√			3	1	0
OYE EKITI	√				√			√		√		√	2	2	0
IKERE		√			√			√		√			1	3	0
ADO			√			√			√		√		0	1	3
OMUO		√		√				√		√			3	1	0
IREPODUN	√				√		√			√			3	1	0
OTUN	√			√			√			√			3	1	0
Total frequency												18	11	3	
Percentage %												56.25	34.3	9.3	

Source: field survey 2017.

From the studies, about 56.25% production is less than 2 sacks daily for a number of bakeries, while 34.3% is about 3-5 sacks daily and 5 sacks is 9.3% daily.

There is less production output of bread in most of the bakeries in the local governments. But this doesn't imply there is lower total production in a particular L.G.A as there could be more bakery outlets across which could be able to meet the demand chain.

4.3 POTENTIAL FOOD QUALITY DETERRENENTS IN THE BREAD SUPPLY CHAIN

Table 6: Hygienic practices among bakers and bread retailers (nB = 32; nBS = 96)

Hygienic practices %	Bakery workers			Bread retailers		
	Always	sometimes	never	Always	sometimes	never
Use of Apron	68%	22%	0%	30.2%	36.4%	33.3%
Wash Hand	65%	28%	6%	33.3%	33.3%	33.3%
Cut fingers	50%	34.3%	15.6%	39.5%	47.9%	12.5%
Hand gloves	18.7%	56.2%	25%	2%	38%	55%
Head gear	28.1%	40.6%	31.2%	29%	52%	18.7%
Face Mask	25%	6%	68.7%	-	-	-
Adq. Bread cov	-	-	-	61.4%	36.4%	2%
Adq. Equip	46.8%	31.2%	21%	-	-	-
Bromate use	37.5%	37.5%	25%	-	-	-
Use of foam to clean bread	-	-	-	YES +ve=	78%	NO-ve= 22%

Source: field survey 2017.

Table 4.5 shows that though the use of head gear by bakery workers is mandatory, the study shows that **31.2%** of the respondents had never use head gear while only **28.1%** always wear it and only **25%** use face mask.

About two-thirds (**68%**) of bakery workers wear aprons regularly while only **18.7%** wear hand gloves regularly and **56%** occasionally while **25%** see no reason to use it. Hand washing before processing bread was almost universally reported by bakery workers. According to the findings by Chukuezi (2010) where **47%** of bakers uses bare hands while working in bakeries, against the standard practice but much higher than **16.7%** reported by Huq et al (2013). However, the use of gloves should protect the hands of workers during packaging and sealing the nylon and is

expected to minimize direct hands contact with finished bread. Therefore, non-use of hand gloves com-promises bread quality safety and health of people who eat them. Among the commercial bread sellers, use of head gear was universally practiced. Only 33.3% reported washing their hands before handling or packaging bread with use of apron practiced by 30% of bread sellers. The study further revealed that high proportion of bread sellers use "foam" to clean bread before packaging at about 78%. This is frequent in most sub-urbs.

Table 7: Average summary of General bakeries hygiene in Ekiti-State: (nB= 32)

Bakery hygiene	Yes	No	Hygienic Frequency	Percentage %	Grade
Closeness to residential area	27	5	5	15.6	Poor
Closeness to any refuse dump	18	14	14	43.75	Poor
Unsanitary drainage	20	12	12	37.5	Poor
Proper refuse disposal	15	17	15	46.875	Poor
Adequate storage space of R.M	19	13	19	59.375	Fair
Is the bakery surrounding bushy	17	15	15	46.87	Poor
Does the bakery has toilet	16	16	16	50	Fair
If yes, is it close to processed area	18	14	14	43.75	Poor
Adequate supply of p. water	16	16	16	50	Fair
Storage room condition	17	15	17	53.12	Fair
Hand washing Facilities	8	24	8	25	Poor
Equipment cleaning	24	8	24	75	Good
Premise cleaning	28	4	28	87.5	Good

Source: field survey 2017

Key: Less than 50% (<16), between 50-70% (16-22) and 70% (>23) above was graded as poor, fair and good level of hygiene respectively in all bakeries assessed.

The level of hygiene in the bakeries assessed was suboptimal with only few facilities assessed having good level of hygiene.

4.4 FOOD SAFETY ARRANGEMENT AMONG BAKERS AND BREAD SELLERS

Table 8: Knowledge of Bread Bakers/Sellers on Food Hygiene (nB = 32; nBS = 96)

Statement		Responses (%)						REMARKS
		VGE	GE	SE	VLE	N	MEAN	
I have professional training, knowledge & awareness of	B							
	BS							
Purchasing quality & proper quantity of ingredients for bread making	B	20.0	44.0	2.0	34.0	0.0	3.50	Agree
	BS	33.0	47.0	1.0	19.0	0.0	3.94	Agree
Hazard Analysis & Critical Control Points (HACCP)	B	0.0	5.0	15.0	30.0	55.0	1.80	Disagr
	BS	0.0	4.0	7.0	25.0	64.0	1.51	Disag
Shelf life & proper storage of bread & ingredients for bread making	B	10.0	20.0	65.0	5.0	0.0	3.35	Agree
	BS	12.0	29.0	48.0	8.0	3.0	3.39	Agree
Regulations governing food vending in Nigeria	B	0.0	5.0	10.0	25.0	60.0	1.60	Disag
	BS	0.0	4.0	8.0	36.0	52.0	1.64	Disag
Food safety standards in Nigeria	B	0.0	5.0	15.0	25.0	55.0	1.70	Disag
	BS	2.0	9.0	12.0	29.0	48.0	1.88	Disag
Food & Drugs Act	B	0.0	0.0	5.0	35.0	60.0	1.45	Disag
	BS	0.0	0.0	12.0	40.0	48.0	1.64	Disag
Personal cleanliness & hygiene Practices	B	40.0	50.0	10.0	0.0	0.0	4.30	Agree
	BS	45.0	39.0	16.0	0.0	0.0	4.29	Agree
Food waste/waste management (storage & disposal)	B	20.0	50.0	30.0	0.0	0.0	3.90	Agree
	BS	30.0	36.0	29.0	5.0	0.0	3.91	Agree
Food pest/pest & insect management and control	B	45.0	30.0	15.0	0.0	0.0	3.90	Agree
	BS	34.0	45.0	21.0	5.0	0.0	4.23	Agree
General food handling (processing, packaging & distribution)	B	40.0	25.0	35.0	0.0	0.0	4.05	Agree
	BS	34.0	38.0	14.0	14.0	0.0	3.92	Agree

Field survey: 2017

Table 8 shows information on the knowledge of bread bakers/sellers in Ekiti on food hygiene and sanitation. The majority of the respondents (bakers =64%; bread sellers = 80%) had professional training, knowledge and awareness of purchasing quality and proper quantity of ingredients for bread making to a great extent. Also, 36% of bakers and 20% of bread sellers had knowledge of food hygiene and sanitation to a slight extent. The person entrusted with purchasing, can buy the product that is best suited for the job, buy the proper quantity of the item, pay the right price for the item, buy from only dependable suppliers and should have knowledge of products and market conditions.

Also, knowledge on HACCP indicated only few of the respondents (bakers = 5%; bread sellers = 4%) had training, knowledge and awareness of Hazard Analysis and Critical Control Points (HACCP). Also, 15% of bakers and 8% of bread sellers had knowledge of HACCP to a little extent while, 85% of bakers and 89% of bread sellers never had knowledge of HACCP. Moreover, 30% of bakers and 41% of bread sellers had knowledge of shelf life, proper storage of bread and ingredients for bread making. A significant number of the respondents (bakers = 65%; bread sellers = 48%) held same views a little extent. None of baker and 3% of bread sellers had no knowledge of the shelf life. A few respondents (bakers = 5%; bread sellers = 5%) were aware of the regulations governing food vending in Nigeria to a great extent. In addition, 10% of bakers and 7% of bread sellers held congruent views to a slight extent. The majority of our respondents (bakers = 85%; bread sellers = 88%) had no knowledge of the regulations governing food vending in Nigeria.

5% of baker and 11% of bread sellers had knowledge of the food safety standards in Nigeria to a high extent; 15.0% of bakers and 12% of bread sellers held same opinion to a slight extent while, the majority (bakers = 80%; bread sellers = 87%) never had knowledge of the food safety

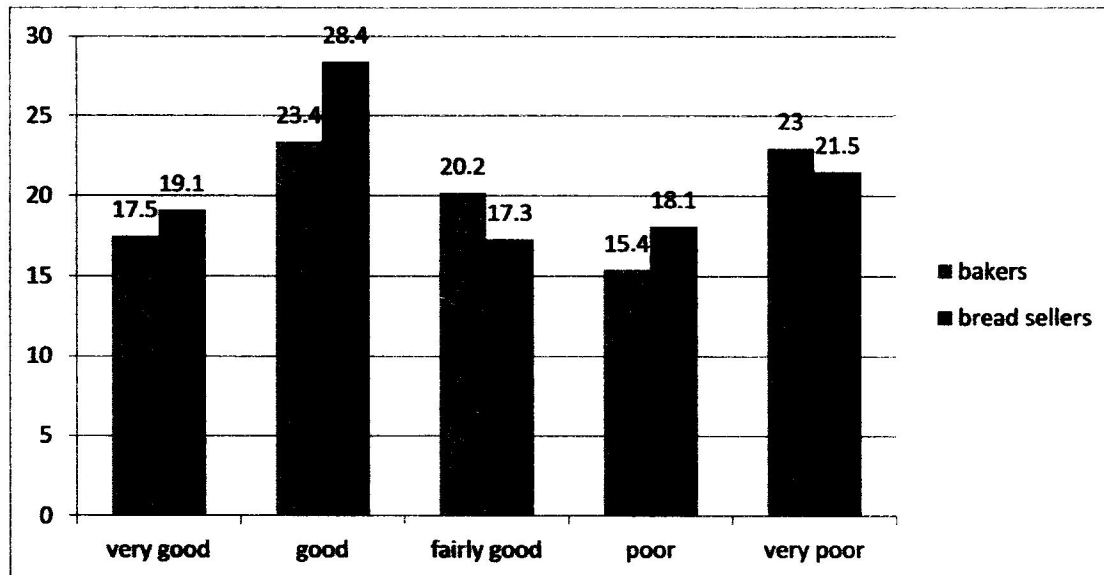
standards in Nigeria. None of the bakers had knowledge of the Food and Drugs Act. A **considerable** number of them (bakers = 5%; bread sellers = 12%) held same views to a little **extent** while, 95% of bakers and 88% of bread sellers had no knowledge. This means that **majority** of both bread bakers and sellers have no knowledge on regulations governing food **vending** and food safety standard issues in Nigeria and hence operate under their own rules **which** may go contrary to the rules and safety measures of the Food and Drugs Act of the **country** Nigeria.

A **large** number of the respondents (bakers = 90%; bread sellers = 84%) had knowledge of personal cleanliness and hygiene practices to a great extent. A lesser number of them (bakers = 10%; bread sellers = 16%) had views to a little extent. This is a positive indication because consumers are most likely to be free from products which may be contaminated as a result of **poor** hygienic practices and poor personal cleanliness. This is supported by Oliveira *et al.*, (2003), they indicated that food elaborated with satisfactory hygienic standards is one of the essential conditions for promoting and preserving health, and inadequate control is one of the factors responsible for the occurrence of food-borne disease outbreaks.

Also, the majority of the respondents (bakers =80%; bread sellers =86%) had knowledge of food waste/waste management, storage and disposal to a high extent. A few of them (bakers =30%; bread sellers =29%) held same views to a slight extent.

A considerable number of the respondents (bakers =85%; bread sellers =79%) had knowledge of food pest/pest and insect management and control. A lesser number of them (bakers =15%; bread sellers =16%) held views to a slight extent. The majority of the respondents (bakers =65% and bread sellers =72%) had knowledge of general food handling (processing, packaging and

distribution to a large extent. Moreover, 35% of bakers and 28% of bread sellers held same views to some extent.



From the above, about 40% of bakers has adequate knowledge on Food hygiene and 38% with poor knowledge. Also, 41% of bread sellers have adequate knowledge and 40% with poor knowledge.

Table 9: health status of the bakers and bread sellers (nB = 32; nBS = 96)

		Bread bakers		bread sellers	
		Freq	%	Freq	%
Frequency of medical Examination per year	None	6	20	15	16
	Occasionally	13	40	43	45
	Quarterly	10	30	21	22
	Bi-annually	3	10	9	10
	Once in a year	0	0	7	7
Whether respondent has history of health-related problems/sicknesses	Yes	16	50	36	38
	No	8	25	35	37
	I don't know	8	25	25	25
Types of health problems/sickness which respondent experienced it in the last few months	Hepatitis B, C	1	5	3	2.0
	Tuberculosis (TB)	0	0	4	4
	Cholera/Diarrhoea	3	10	12	13
	Typhoid fever	3	10	11	12
	Skin rashes	10	30	9	9
	Others	14	45	57	60

Source: field survey 2017.

Table 9 further revealed that 20% of bakers and 16% of bread sellers never had medical examination as a requirement for their work. However, 40% of bakers and 45% of bread sellers occasionally had medical examination per year; 30% of bakers and 22% of bread sellers had quarterly medical examination or screening. Also, 10% of bakers and 10% of bread sellers had medical examination bi-annually while, 7% of bread sellers went for medical examination once in a year. It could be concluded that, majority ($\geq 60\%$) of the respondents rarely go for medical examination. McSwane, Rue & Linton (2000) indicated that, even if a food handler does not feel sick, he or she can still be carrying microorganisms on their body or clothes that can cause illness if they get into food. Hence, illness such as the common cold, sore throat, Pneumonia, scarlet fever, tuberculosis and trench mouth could be transferred into food even if the handler feels normal. The food handler can often be a major source of contamination. Therefore, the practicing of good personal hygiene is essential for those who handle foods. Based on this, it is also imperative for food handlers to go for medical check up to ensure that they are

free from any form of ailment which can cause contamination of food and lead to food borne illness in the final consumer.

Based on if the respondents had history of any health-related problem or sickness for the past few months, 50% of bakers and 38% of bread sellers answered in the affirmative; 25% of bakers and 37% of bread sellers indicated 'no' while, 25% of bakers and 25% of bread sellers did not know at all. On the type of health problem or sickness which respondents experienced in the last few months, (bakers = 5%; bread sellers = 2%) mentioned hepatitis B, C. This was followed by cholera/diarrhoea (bakers = 0%; bread sellers = 4%), typhoid fever (bakers = 10%; bread sellers = 13%); skin rashes (bakers = 30%; bread sellers = 9%); and other illnesses (bakers = 45%; bread sellers = 60%). None (0%) of the respondents was affected by TB in the past few months.

The above findings indicate that some of the bread bakers and sellers were not medically fit to handle food meant for public consumption. This agrees with (WHO, 2001) that, a food handler implicated to be a carrier of a disease or illness should neither be allowed to go into food handling areas or handle food. Medical examination is necessary for bread bakers and sellers to be checking themselves to enable them to be fit and safe in selling food to the public.

Table 10: Agencies which Conduct Inspection on Bakery and Bread Sales Premises in the Local governments.

Response	Bakers (%)	Bread Sellers (%)
Environmental Protection Agency	0	0.0
Local Authority Environmental Health Unit	90	100
Nigeria Health Service	0	0
Food and Drugs Board/Authority	10	0
Other	0	0
Total	100	100

Source: field survey 2017.

Table 10 shows that the Local Authority Environmental Health Unit was responsible for the inspection of bakery and bread sales premises in the district/local governments. The response by both the bakers and sellers recorded 90% and 100% each which vividly showed that all the bakers and the sellers are aware that the agency responsible for the inspection on bakery and bread sales premises in the local governments is the Local governments Environmental Health Unit. This means that the bakers and sellers are aware that their premises need to be inspected to be free from rubbish or debris which can cause disease to the food they produce or sell.

Table 11: Frequency of Inspection on Bakery and Bread Sales Premises by Agencies in Ekiti states local government

Response	Bakers%	Bread Sellers (%)
Quarterly	5.0	19
Twice a year	40	25
Once a year	35	40
Once in two years	0	0.0
Occasionally	20	10
Total	100	100

Source: field survey 2017.

On the issue of frequency of inspection of the bakery and bread sellers premises by the agencies in Ekiti, 19% of bread sellers indicated that premises were inspected quarterly; 40% of bakers and 25% of bread sellers mentioned twice a year while, 35% of bakers and 40% of bread sellers stated once a year. 20% of bakers said occasionally likewise 10% of bread sellers. The data collected showed that, majority of the bakers and sellers premises is inspected and it's usually within the period of one and two years. Though few indicated their premises is inspected quarterly, and occasionally. This means that the inspection agency in the local governments

usually carry out the inspection to ensure that bakers and sellers comply with hygienic and sanitary rules to ensure sale of safe or wholesome food to the public.

4.5 LEVEL OF COMPLIANCE TO STANDARDS IN BREAD SUPPLY CHAIN.

Table 12: Bread Bakers/Sellers level of Compliance with Regulations Governing Food Vending in Nigeria (nB = 32; nBS = 96)

Statement As a food handler (baker/bread seller), I comply with.....		Responses (%)						
		VGE	GE	SE	VLE	N	Mean	Remarks
Prohibition against sale of poor quality food	B	17.0	20.0	63.0	0.0	0.0	3.54	Agre
	BS	36.0	24.0	40.0	0.0	0.0	3.96	Agre
Mandatory fortification of food(bread) with iodised salt	B	0.0	10.0	20.0	55.0	15.0	2.25	Disg
	BS	1.0	19.0	28.0	42.0	20.0	2.69	Disg
Storage & conveyance of food (bread) in a manner that preserves composition, quality, purity & nutritive properties	B	15.0	30.0	55.0	0.0	0.0	3.60	Agre
	BS	30.0	16.0	54.0	0.0	0.0	3.76	Agre
Preparation, packaging, storage or display, conveyance & sale of food(bread) under sanitary conditions	B	25.0	25.0	50.0	0.0	0.0	3.75	Agre
	BS	26.0	39.0	35.0	10.0	0.0	4.11	Agre

Source: field survey 2017.

Table 12 provides responses to whether bakers and bread sellers comply with regulations governing food vending in Nigeria. A lesser proportion (37%) of the bakers and 60% of bread sellers complied with regulations on prohibition against sale of poor quality food to a large extent. Also, 63% of bakers and 40% of bread sellers complied with it to a little extent.

A few (10%) of the bakers and 20% of bread sellers complied with the regulations governing mandatory fortification of food (bread) with iodised salt. 75% of bakers and 70% of bread sellers complied with it to a low extent while 15% of bakers and 20% of bread sellers never complied with it at all.

With respect to mandatory fortification of bread with iodated sated, 35% of bakers and 37% of sellers comply with the regulation to some extent where as 65% of bakers and 63%of sellers either comply to a little extend or do not comply to it at all.

Regarding proper storage and conveyance of bread, 45% of bakers and 36% of sellers comply with some extent while the majority 55% of bakers and 54% of sellers comply to a little extent. A total of 60% bakers and 79% of bread sellers complied with the regulations governing preparation, packaging, storage or display, conveyance and sale of food (bread) under sanitary conditions to a large extent. A few of the respondents (bakers =40%; bread sellers = 21%) complied with it to a slight extent.

It could be concluded from the results in Table 8 that the bakers, and the bread sellers fairly complied with complied with regulations on prohibition against sale of poor quality food; mandatory fortification of food with iodised salt; storage and conveyance of food in a manner that preserves its composition, quality, purity and nutritive properties; and regulations governing preparation, packaging, storage or display, conveyance and sale of food (bread) under sanitary conditions. However, the data revealed that 20% of the bakers and 16% of the bread sellers did not comply with the regulations governing mandatory fortification of food with iodised salt.

Table 13: showing General skewness of compliance Statistics

		VERY GREAT EXTENT	GREAT EXTENT	SOME EXTENT	VERY LITTLE EXTENT	NOT AT ALL
N	Valid	8	8	8	8	8
	Missing	21	21	21	21	21
Mean		18.7500	22.8750	43.1250	13.3750	4.3750
Std. Error of Mean		4.62814	3.14210	5.24553	7.85797	2.90282
Std. Deviation		13.09035	8.88719	14.83661	22.22571	8.21040
Skewness		-.430	.549	-.307	1.450	1.553
Std. Error of Skewness		.752	.752	.752	.752	.752

From the above, the compliance level is symmetrically skewed to a Great Extent 0.549. This therefore implies that both respondents comply with a Great Extent

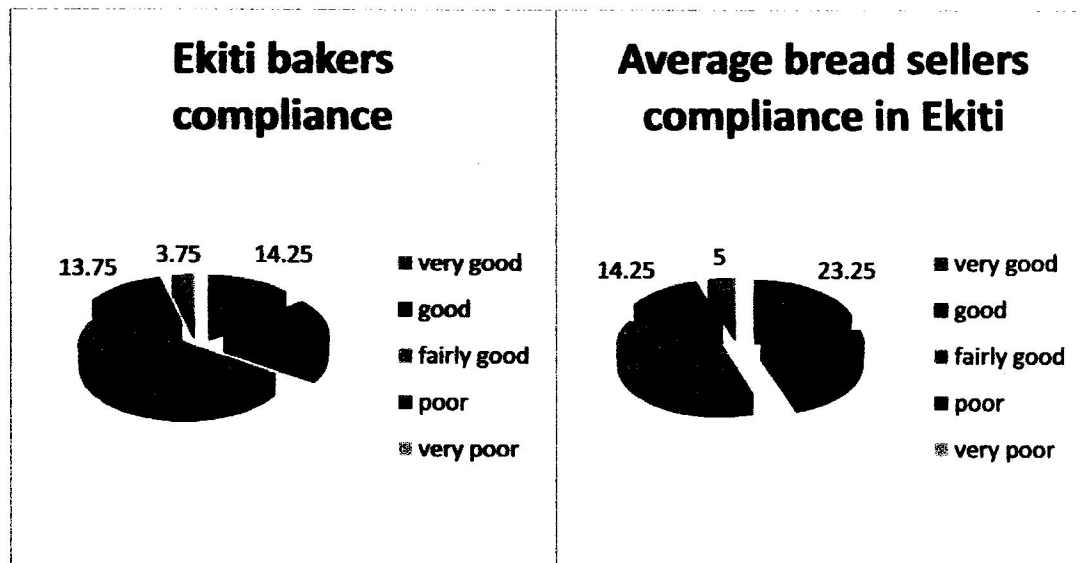


Figure 2

Figure3

It could be concluded from the results that a reasonable number 47% of the bakers, and 39% of the bread sellers satisfactorily complied with regulations governing food vending in Nigeria. This is also evident in the observation data which shows that above 70% of the bakers and bread sellers satisfactorily complied with food safety Acts, laws and standards in Nigeria.

The result indicated that 43.12% of the food handlers (bakers and bread sellers) satisfactorily complied with food safety Acts, laws and standards in Nigeria.

Table 14: Respondents Comply with all Relevant Food Safety Standards

Response	Bakers (%)	Bread Sellers (%)
Yes (Adopters)	15.0	5.0
No (Non Adopters)	85.0	95.0
Total	100	100

Source: field survey 2017.

Only 15% of bakers and 5% of bread sellers complied with all the relevant food safety standards. The majority of the respondents (bakers = 85% and bread sellers =95%) did not complied with the relevant food safety standards. The data collected revealed that, though the inspection agency make routine visit to their premises majority of the bakers and sellers do not still comply with the relevant food safety standards which contravenes with the Food and Drugs Act on prohibition against sale of poor quality food.

Table 15: Respondents Work to Hygiene Standards given by the Government

Response	Bakers%	Bread Sellers (%)
Yes	15.0	8.0
No	85.0	92.0
Total	100	100

Source: field survey 2017.

Table 15 the data indicates that majority 85% of bakers and 92% of bread sellers did not comply with hygiene standards given by the government regulatory body. However, few respondents (bakers =15%; bread sellers = 8%) affirmed that they work to hygiene standards given by the government regulatory body. This is an indication that majority of the bakers and bread sellers breaches the Food and Drugs Act which is on sale of food under unsanitary conditions.

Table 16: Showing the regression of compliance for both bakers and bread sellers.

Dependent variable: compliance (adopters/non adopters)

Independent Factors: constant, Level of Edu, No of yrs., knowledge practice, inputs and type of operator.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.012	.096		-.128	.899		
	level of education	.609	.134	.536	4.550	.000	.300	3.334
	no of years	-.005	.056	-.011	-.099	.922	.341	2.937
	knowledge practices	.593	.096	.523	6.189	.000	.585	1.711
	inputs credits	-.002	.021	-.008	-.112	.912	.815	1.227
	ty pe of operator	.050	.054	.063	.940	.356	.928	1.078

a. Dependent Variable: compliance

From the above, Major factors; the level of education, knowledge of practice and type of operator(Full time or Part time) has a significant effect/correlation on the level of compliance to Food safety practices. This implies the higher the level of Education, the more the respondents are exposed to food safety compliance. As their Field operation will be govern by knowledge rules.

The knowledge practices to food safety if low can reduce the level of compliance to food safety. The type of operator either part time or Full time can influence the food safety compliance in which full time individuals might have full dedication to the business and therefore create room for compliances to ensure business product safety. Other factors include inputs credits, Number of years in the business have minimal/no influence in the compliance study.

4.6 CONSTRAINTS TO FOOD QUALITY PRACTICES IN BREAD SUPPLY CHAIN.

Table 17: Constraints to Food quality (nB= 32, nBs=96)

Constraints	BAKERS			BREAD SELLERS		
	Frequency	percentage	Ranking	frequency	Percentage	Ranking
Inadequate fund	25	25	1 st	56	30	1 st
Education	18	18	2 nd	45	24	2 nd
Knowledge practices	13	13	3 rd	30	16	3 rd
Inputs(credit sources	12	12	4 th	22	12	5 th
Price of materials	12	12	4 th	-	-	-
Labor availability/cost	8	8	5 th	-	-	-
Location of business	7	7	6 th	21	11	4 th
Bad roads	5	5	7 th	-	-	-
Others	0	0	8 th	12	7	6 th

Multiple responses allowed*

From the studies, inadequate fund seems to be the major constraints in both the bakers 26% and bread sellers/retailers 30% Both having over ¼ effects on the business. The level of Education has significant constraints to the bakers 21% and bread sellers 28%. This makes Education second significant. There is also same selection in the 3rd ranking, as knowledge practices have 15% for bakers and 22% for bread sellers. Inputs and price of materials(ingredients, safe equipment etc.) are close in margin in the 4th constraint for bakers with about 14% influence while the 4th constraints is where the bread sellers are located (this could be due to competition,

customer accessibility among sellers). The remaining constraints for bakers include labor availability/cost 6th, bad road or inaccessible communication channel leveled at 6%. While the bread seller's selection was others as it could be due to rent/ownership issues, family issues etc. From the research, sources of input comes mainly from others which includes personal savings, borrowings, family support, rents income, service payment from other jobs etc.

From research, most bakers in Ekiti establish and finance their business internally. Business personally financed has a great deal to a number of extents in terms of conflict arising from banks loan or cooperate loans. Most Bakeries in the remote areas are family owned business in which Labor is crucially family or relative members. This therefore reduces labor cost in turn the cost of production.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The bread sellers often leave their bread exposed granting access to flies which are common in a humid, hot environment. These flies have been shown by various studies to transmit food borne pathogens which can cause food borne illnesses such as Cholera, Campylobacteriosis, *E. coli* gastroenteritis, Salmonellosis, Shigellosis, Typhoid and paratyphoid fevers, Brucellosis, Amoebiasis, and Poliomyelitis (De Jesus et al., 2004; Keiding 1986; WHO, 1997). The unwholesome practice of cleaning bread with foam has subtly been reported in literature and is a major mechanism for contamination of staple bread as it provides opportunity to expose the bread to handling with hands that are rarely ever washed before handling bread; the hands are used in transactions such money exchange which has been reported in a study by Nurudeen et al. (2014). Hygiene of the bread sellers was assessed and in this study it was discovered that use of head gear among bread sellers is mostly practiced perhaps due to the fact that they were majorly female and it is culturally/religiously inappropriate for most women to leave their head uncovered.

5.2 CONCLUSION

Hygiene of bakeries assessed was below economic threshold as most bakeries lack congruent facilities due to financial/social support. As most bakeries operate limited with available consumers. This therefore reduces the standard and quality of bread making in most part which can in turn impair export of bakery products and other disadvantages. Although, bread bakers and sellers lacked requisite knowledge on food hygiene and sanitation practices, the study found bakers and sellers of bread were clean in terms of personal appearance, work materials and

general work surroundings. An average number of bread bakers and sellers fairly complied with food safety Acts, laws, standards, and regulations governing food vending in Nigeria.

5.3 RECOMMENDATION

- The hygiene conditions in bakeries, handling of bakeries processes by bakers and attitude of bread vendors is suboptimal and predisposes bread to contamination by pathogenic and non-pathogenic microorganisms. Therefore, regulatory agencies, States ministries of health and environmental health units of local government areas should ensure compliance and adherence of bakeries and bread sellers to the regulations and public health ordinance guiding the approval and monitoring of bakeries as a regulated premise.
- There is need for re-orientation of bakeries on the basic ideal practice which has to be enforced to sound the seriousness of government to entrench sound bakery operations and practice in Nigeria. Therefore, all bakery workers should receive training in food hygiene.

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APPENDICES
APPENDIX A
DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION, FEDERAL
UNIVERSITY OYE EKITI, EKITI-NIGERIA
Questionnaire on "FOOD SAFETY IN THE BREAD SUPPLY CHAIN" IN EKITI
STATE, NIGERIA
Dear respondent,

This questionnaire was designed for the purpose of research and information on the above topic, your response will highly be held in confidence.

Thanks for your cooperation.

OMONIYI S.T

QUESTIONNAIRE FOR BAKERS AND BREAD SELLERS

SECTION A: BACKGROUND INFORMATION (PLEASE TICK(✓))

1. L.G.A.....
2. Gender: Male Female
3. Age group 13-25 (), 26-49 (), 50 – above ()
4. Formal educational level attained: (a) None (b) Primary (c) Secondary (d) Professional Certificate (e) OND (f) HND (g) Bachelor (h) Masters (i) PhD (j) adult education
5. What is your primary occupation? (a) Farming () (b) Civil servant () (c) Contractor () (d) Trading () (e) Bakery() (f) others () please specify.....
6. Number of years in bread baking/vending industry or business:
Below 5 years 5-10 11-15 16 years & above
7. Description of the type of bread baking/vending industry or business. Small-scale Medium-scale Big/Large-scale Very large-scale.
8. How frequent do you have medical examination per year as part of your work?
None Occasionally Quarterly Bi-annual Once a year
9. Do you have any history of health-related problems/sicknesses over the last few months? Yes No I don't know
10. If yes (in item 8), indicate the specific health problem(s)/sickness(es)
Hepatitis B, C Tuberculosis (TB) Cholera Diarrhoea Typhoid fever
Skin rashes Other , specify:
11. Type of retailer: (a) Full time farmer (b) Part time farmer.
12. How do you get your inputs like credit etc. a. government b. local markets c. Both d.others (Specify).....
13. Sales channel Shop () kiosk () hawk () motor() Others (Specify)

14. Mode of transport: car () truck () bus () bike () hawk () Others (specify)

SECTION B: KNOWLEDGE OF BAKERS AND BREAD SELLERS WITH REGARD TO FOOD HYGIENE AND SANITATION (PLEASE TICK (✓))

Please tick (✓) to indicate your level of knowledge in food hygiene and sanitation. Use the Likert scale as below: **VGE** = Very Great Extent; **GE**= Great Extent; **SE** =Some Extent; **VLE**= Very Little Extent; **N**= Not at all.

Statement	Responses				
	VGE	GE	SE	VLE	N
I have professional training in and/or knowledge and awareness of					
15. purchasing quality & proper quantity of ingredients for bread making					
16. purchasing quality & proper quantity of ingredients for bread making					
17. Hazard Analysis & Critical Control Points (HACCP)					
18. shelf life & proper storage of bread as well as ingredients for bread making					
19. regulations governing food vending in NIGERIA					
20. food safety standards in NIGERIA					
21. Food & Drugs Act 1990					
22. personal cleanliness & hygiene practices					
23. food waste/waste management (storage & disposal)					
24. Food pest/pest and insect management and control					
25. General food handling (manufacturing/processing, packaging & distribution) practices					
26. the bread baking/vending industry or business					

27. Have you heard about the Food and Drug Laws of NIGERIA and other Food Safety and Standards Act/ Food Safety Act? Yes [] No [] I can't remember []

28. What do these food safety and standards Act means to you?

.....

29. Bread seller/baker has valid and certified medical certificates which are available: Yes [] No []

SECTION C: COMPLIANCE WITH REGULATIONS GOVERNING FOOD VENDING IN NIGERIA (FOOD & DRUGS ACT)

Please (Tick (✓) the statements below to reflect the extent or level of compliance with regulations governing food (bread) production and vending in NIGERIA (FOOD & DRUGS ACT 1990, Section 21):

Statement	Responses				
	VGE	GE	SE	VLE	N
<i>As a food handler (bakers/bread seller), I comply with the following provisions in the NIGERIA Foods & Drugs Act 1990, and other food safety standards</i>					
30. prohibition against sale of poor quality food.					
31. mandatory fortification of food (bread) with iodised salt.					
32. storage and conveyance of food (bread) in a manner that preserves its composition, quality, purity and minimizes the dissipation of its nutritive and organoleptic properties from any climatic and any other deteriorating conditions.					
33. preparation, packaging, storage or display, conveyance and sell of food (bread) under sanitary conditions.					

34. Which agencies conduct inspection on your bread production (bakery) and selling premises/?

Environmental Protection Agency [] Local government council Area [] Nigeria Health Service [] Food & Drugs Board []

Any other [] specify:

35. How regularly do they visit?

Quarterly [] Twice a year [] Once a year [] Once in two years [] occasionally []

36. I comply with all relevant food safety standards. Yes [] No []

37. Do you think you work 100% to the hygiene standards given by the government?
Yes [] No [] I don't know []

38. If Yes/No in (question 108) above, give reason(s) for your answer

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**APPENDIX B
OBSERVATION CHECKLIST
SANITATION AND HYGIENE PRACTICES AMONG BAKERS AND BREAD SELLERS**

Questions	ALWAYS	SOMETIMES	NEVER
Use of apron			
Washing of hands			
Cutting of finger nails			
Use of hand gloves			
Used of head gear			
Use of face mask			
Use of bromate to support bread			
Use of adequate mixing equipment			
Sales of stale bread			

Variables	Yes(+ve)	No(-ve)
Is bakery close to residential area?		
Is the bakery close to any refuse dumping ground		
Are there any unsanitary drainage around the bakery		
Does the bakery have proper refuse disposal system		
Does the bakery has adequate space for storage of its Raw materials		
Is the bakery surrounding bushy		
Does the bakery have toilet		
If Yes, is the toilet separated from the processing area		
Does the bakery have adequate supply of portable water		
Are doors and windows of the storage room adequately protected from insect/pest		
Does the bakery have hand washing facilities		
Are the equipment cleaned regularly		