CONTRIBUTION OF FOOD SAFETY BEHAVIOUR TO HEALTH STATUS OF RURAL DWELLERS IN SOUTHWESTERN NIGERIA

BY

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ABSTRACT

Appropriate food safety behaviour (knowledge, attitude and practice) is one of the predictors of sound health. Poor food handling in most rural households often leads to food contamination which could impact negatively on their health status. There are previous studies on food safety knowledge, attitude and practices however, there is a dearth of information on nexus between food safety behaviour and health status of rural households. Therefore, the contribution of food safety behaviour to health status of rural dwellers in Southwestern Nigeria was investigated.

A four-stage sampling procedure was used. Three of the six states (Oyo, Ogun and Ekiti) in Southwestern Nigeria were randomly selected. Twenty percent of rural Local Government Areas (LGAs) from these states (4, 3 and 2, respectively) were randomly selected to give nine LGAs. Thereafter, two wards each were randomly selected to give 8, 6 and 4 for Oyo, Ogun and Ekiti states, respectively. Using proportionate sampling technique, 5% of rural households were selected from the wards to give a total of 270 respondents. Interview schedule was used to elicit information on respondents' socio-economic characteristics, sources of information on food safety, food safety behaviour (knowledge, attitude and practice), constraints to food safety practices, food borne illness experienced, health care utilisation and health status. Indices of health status (poor, 0.3-8.9; good, 9.0-13.2), food safety behaviour (inappropriate, 0.0-6.5; appropriate, 6.6-11.1), comprising knowledge (low, 2.0-13.8; high, 13.8-19.0), attitude (unfavourable, 23.0-47.1; favourable, 47.2-68.0), practice (low, 12.0-31.8; high, 31.9-40.0), were generated. Data were analysed using descriptive statistics, Pearson product moment correlation, ANOVA and multiple regression at $\alpha_{0.05}$.

Respondents' age, years of formal education and monthly income were 43.0±11.9 years, 8.5±16.3 years and ₦33,324.00±₦12,300.00, respectively. Majority of respondents were female (75.6%) and married (82.2%), with household size of 4.8±1.8 persons. Food safety information was mostly sourced (95.1%) from friends and family. Knowledge of food safety was high (63.7%) among the respondents, while 58.9% had unfavourable attitude to food safety. Most respondents (61.9%) used food safety practices, while 56.3% had

appropriate food safety behaviour. The major constraints to food safety practices were lack of infrastructure (83.5%) and inadequate finance (80.0%). Fever chills (50.4%) was the most experienced foodborne illness, while self-medication was the health care service mostly utilised (1.88±0.26). Majority of respondents (62.2%) had good health status. Food safety behaviour (r=0.330) was significantly related to health status. Respondents' food safety behaviour differed significantly among the states. Food safety behaviour was appropriate in Oyo state (6.9±2.2), but inappropriate in Ogun (6.4±1.7) and Ekiti (5.8±3.1) states. Respondents' had good health status in Ogun (9.8±1.8) and Oyo (9.3±1.8) states but poor in Ekiti (7.2±3.1) state. Respondents' health status depended more on knowledge of food safety (β=0.323) than attitude to food safety (β=0.180) and food safety practices (β=0.107).

The food safety behaviour of rural households contributed positively to their health status. Sensitisation programmes on available media should be launched in rural areas to raise awareness on importance of appropriate food safety behaviour.

Keywords: Knowledge of food safety, Attitude to food safety, Food safety practices, Food safety behaviour, Health status

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DEDICATION

This thesis is dedicated to God, the father of my Lord Jesus Christ and to the Holy Spirit the pillar that sustained my life throughout the course of this study. And to my grandchild Esther Adeola Jesudarasimi Mobolade who shared the same birthday with me.

CERTIFICATION

I certify that this study was carried out by ADEWOYE, Beatrice Adewale, in the Department of Agricultural Extension And Rural Development, University of Ibadan, Nigeria.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Food, a basic necessity of life, derives its importance from the fact that it stimulates appetites, supplies a variety of ingredients that give energy (carbohydrate, fat, dietary fibre), replace worn out tissues, thus promoting growth (protein) and help in preventing and curing diseases (vitamins and minerals) (Ifenkwe 2012). However, the manifold sources of materials which we use as food and the large number of processes it undergoes before it is eaten create a fairly high probability that it might become an infective agent (Akintaro, 2012). Food, through improper handling could be a source of infection leading to illness and diseases, poor health, increased medical bills and reduced productivity (FMH, 2010). Past researches show that diseases spread through food are common and are persistent problem that result in appreciable morbidity and occasionally in death (WHO, 2011, FMH, 2010 & FAO, 2008). Food is considered to be a significant reason for the considerable number of diseases in the entire world. It is also believed that 75% of the human diseases stem from food (FSHC, 2006). Past researches on food and health, show that food safety is the key to preventing the manifold health hazards associated with food (Hui *et al* 2017, Fasoro *et al*, 2016, Boro *et al.* 2015).

According to World Health Organisation (WHO 2011), food safety is a scientific discipline describing handling, preparation and storage of food in ways that prevent food-borne illness. This includes a number of routine that should be followed to avoid potentially health hazards. Health risk associated with the occurrence of food-borne illnesses in Nigeria is higher in rural areas because rules of personal hygiene and other principles of food safety are violated in rural areas more than in urban areas (FSS, 2009). In theory it is believed that food poisoning is 100 percent preventable by following critically the five key principles of food safety developed by WHO, (2007) which are:

1. Preventing contaminating food with pathogens spreading from people, pets and pests.
2. Separate raw and cooked foods to prevent contaminating the cooked foods.
3. Cook food for the appropriate length of time and at the appropriate temperature to kill pathogens.
4. Store food at the appropriate temperature
5. Do use safe water and raw materials for cooking.

The WHO-EURO surveillance programme defines food-borne disease as a disease of an infectious or toxic nature caused by consumption of contaminated food or water (WHO, 2015).Typical symptoms include nausea, vomiting, abdominal cramping and diarrhoea that occur suddenly (within 48 hours) after consuming contaminated food/drink (FAO, 2005). It is estimated that 70 percent of the approximately 1.5 billion episodes of diarrhoea that occur in the world annually are directly caused by biological or chemical contamination in foods (FAO, 2005). Serious outbreaks of foodborne diseases have been documented in every continent in the past decade. This illustrates both the public health and social significance of these diseases outbreaks with ever increasing concern (FAO, 2012). The Centre for Disease Control and Prevention (CDCP 2013), estimated an annual occurrence of 47.8 million, 2million and 750,000 cases of food-borne illnesses in the United States, United Kingdom and France, respectively. It is also estimated that in Australia, there are 5.4 million cases of food borne illnesses every year causing 18,000 hospitalisations, 1,200 deaths, 24 million lost days of work, 1.2 million doctor consultations and 300,000 prescriptions for antibiotics. WHO (2015), states that up to one third of the developed countries are affected by food-borne illnesses each year and that the problem is likely to be even more widespread in developing countries. WHO, further affirms that food and water-borne diarrhoea diseases are the leading causes of illness and death in less developed countries killing an estimated 2.2 million people annually most of whom are children. It was noted further that the burden posed by food-borne illnesses has affected the realization of the millennium development goals (MDGs) and other global development efforts in the developing countries. The population in developing countries are more prone to suffer foodborne illnesses because of multiple reasons which include: lack of access to clean

water for food preparation, inappropriate transportation and storage of foods and lack of awareness regarding safe and hygienic food practices (FAO 2014).

Nigeria has over the years grappled with the problem of food-borne diseases with their attendant social, economic and health costs (Ihesiulo, 2010). He further stated that thousands of people die every year as a result of food and water borne diseases than other causes of illness. A research conducted by the Food Safety Service of Nigeria (2009), found that the nation's food markets have very poor sanitation and one hardly buys food that is wholesome. The sellers display their wares on the ground with dusts and flies, ants and cockroaches surrounding them, some butchers sell meat of sick and dead animals leading to various kinds of diseases. The incidence of food-borne disease and gastro enteritis in Nigeria is thought to be the highest in the world (WHO, 2015). The cholera outbreak in Nigeria has become very rampant in recent times and it is peculiar to consumption of unsafe food and water (WHO, 2015). Researches have also proved that poor personal hygiene and environmental sanitation are key factors in the transmission of foodborne disease throughout the world which are caused by failure to observe satisfactory standards in the preparation, processing, storing or retailing food (Abuga *et al.* 2017, Geetha *et al*. 2017, Rafiq and Itrat, 2017, Tran Ngoc, 2015).

The home more than any other place have been implicated for food-borne disease outbreak (Byrd-Bredbenner *et al*. 2013). Fatemeh *et al* (2017), reported that 70 percent of foodborne illnesses occur at household level, due to unsafe food handling and preparation methods. They further observed that in rural community, people do not observe simple rules of hygiene about the care of food and that general sanitation are not observed or maintained. Similarly, Fasoro *et al.* (2016), observed that food preparation in rural households follows the traditional practices most of which are deleterious to health of the household members. These problems are not unconnected to socio-cultural constraints such as social substructure, ignorance, incorrect beliefs and practices, taboos, poverty, insufficient food, lack of safe water and sanitation (Omemu, Oloyede & Amadi, 2011). In addition to the above, Nigeria have limited capacity to implement rules and regulations regarding food safety WHO, 2015).

Health is a critical component of household well-being. It is a capital good that can either improve or reduce households' productive ability. Poor health reduces income and productivity in agricultural communities which further decreases peoples' ability to address poor health and inhibiting economic development (WHO, 2015). Health as defined by Nurinadum, (2009) is a state of physical, emotional, social, mental and spiritual well-being and not necessarily the absence of diseases. In the same vein, WHO (2011) defines health as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. In essence, having good health is fundamental to living a productive life, meeting basic needs, contributing to community life and an enabling condition for the development of human potential (Lutoniski *et al*, 2017).

Measuring health status is challenging and can be viewed from different angles. It is a multidimensional concept; therefore, there is no single standard measurement of health status for individual or population groups (CDCP, 2011). Health status is usually measured in terms of absence of physical pain, absence of disability or a condition that is likely to cause death, emotional well-being and satisfactory social functioning (CDCP, 2011). According to WHO (2000), health status can be measured using pathological or clinical measure through the use of medical instruments. The physician performs medical examination and rates individuals along several indices including presence or absence of life threatening illness, risk factor for premature death, severity of diseases and overall health. The non-clinical way of assessing health status is by asking the person to report his or her health perceptions in the domain of interest such as physical functioning, emotional wellbeing, pain or discomfort and overall perception of health (CDCP, 2011).

The WHO (2013), reported that health status is a particular concern in rural areas where the population is older, has lower education and income levels and with little or no medical care/facilities. Frequent foodborne illnesses experienced by rural households has been linked to inadequate diet and consumption of unsafe food / water which have impacted negatively on the health status of rural households leading to poor health (ILO, 2010). In agricultural population, rural households with poor health are less able to work, this cuts down productivity and income, perpetuates a downward spiral into ill-health and poverty and further jeopardizes food security and economic development (WHO, 2016).

1.2 Statement of the problem

Food safety has emerged as an important global issue in reducing the serious negative impact of food-borne disease worldwide. Available literature affirms that paying attention to food safety is an essential element in improving the health status of people (WHO 2016). Household can have adequate access to sufficient food but health status may remain poor due to consumption of unsafe foods. Unsafe food poses a risk of causing food-borne diseases. Ekezie (2015) asserts that foodborne diseases are among the most important underlying factors of poor health especially in rural areas of Nigeria. Eneji Mai-Lafia, and Song (2013) pointed out that overall health status in Nigeria is relatively poor due to food-borne illnesses which are among the major diseases that contribute to poor physical and mental health. Poor health reduces income and productivity which further decreases peoples' ability to address poor health and inhibiting economic development (WHO, 2015).

The home environment represents an important site for the spread of pathogens responsible for food-borne illnesses (Elisa, 2012). In rural areas of Nigeria, the home setting is conducive to food-borne illness infection due to poor personal and/or environmental hygiene, such as lack of safe drinking water, inadequate waste disposal, poor food sanitation as well as poor pest and vector control (Fasoro *et al*, 2016). The prevalence of foodborne disease in the home has been established although many cases are not reported and therefore under-represented in outbreak statistics (Day, 2001). In support of this WHO (2016), affirms that 30-40 percent of foodborne cases occur in private homes.

Continuous consumption of unsafe food is contributing to public health, seriously leading to numerous chronic and non-chronic diseases especially in rural areas (FAO 2014). In recognition of the importance of food safety as an essential factor for achieving a high level of health for all Nigerians, the government of Nigeria launched the National policy of food hygiene and safety in the year 2000 as an integral part of the Nigerian National Health Policy. The overall goal of this policy was the attainment of a high level of food hygiene and safety practices that will promote health, control food borne diseases, minimise and finally eliminate the risk of diseases related to poor food hygiene and safety (Fatiregun, Oyebade, & Oladokun, 2010). However, in spite of the above efforts cum other food safety

regulations and policy put in place by government, food-borne diseases still persist especially in the rural areas of Nigeria (FAO, 2012). Also, literature has established the prevalence of food borne diseases and lack of food safety practices in rural households in Southwestern Nigeria. For example, in separate studies done by Fasoro *et al,* (2016), Oladoyinbo and Awosika (2015), Bamidele, *et al* (2015), Omemu and Oloyede (2014), Sofela *et al,* (2014), have uncovered poor knowledge, unfavourable attitude and poor hygienic practices among the food handlers as the cause of food-borne illness outbreaks. Also where the food handlers have adequate and favourable attitude to food safety this does not translate to correct food safety behaviour (Osagbemi, Abdulahi & Aderibigbe 2010). In addition to this, Hedberg *et al* (2012) assert that most foodborne outbreak at home are as a result of poor personal hygiene, inadequate holding time and temperature, cross contamination and improper storage. They therefore recommend the need to improve food safety behaviours for particular target groups especially women who play an important role in ensuring food safety throughout the chain of production, processing, storage and preparation. Similarly, Fatemeh *et al,* (2017), state that failure of households to follow satisfactory standard in food preparation may be due to lack of knowledge as well as their attitude which at times reflect on their behaviour towards practicing food safety.

The review of literature on food hygiene interventions for households in developing countries (including Nigeria) done by Woldt and Moy (2015), found that the most common households food safety behaviour that result in food contamination with pathogens and microorganisms are: storage of cooked food at ambient temperature for an extended period of time, inadequate reheating of food, contamination with pathogens from hands, use of raw food with high level of pathogens, inadequate initial cooking of food, contamination by pathogens from utensils and use of water with high level of pathogens. Furthermore, they found that improved sanitation can reduce transmission of diarrhoea disease by 28%, use of safe water by 45%, hand washing with soap by 23% and food hygiene by 33% respectively.

Consumer behaviour to food safety practices is often explained through the knowledge, attitudes and practices model (Geetha *et al.,* 2017). It is believed that knowledge and attitudes may influence one's intention to perform a given practice, thus they are correlated with behaviour. Several studies conducted to assess knowledge, attitudes and behaviour

concerning food-borne diseases and food safety issues among food handlers found a poor relation between knowledge, attitude and practices (Geetha *et al*., 2017, Abuga *et al*, 2017, Tran Ngoc, 2015). Although, there are several studies on food safety knowledge, attitudes and practices of households (Fatemeh *et al*, 2017, WHO 2016; Mendagudali *et al*, 2016, Murungi 2016, Tolulope *et al*, 2015), there is a dearth of information on how food safety behaviour impact health status of rural households. This study was therefore undertaken to ascertain the contribution of food safety behaviour to health status of rural dwellers in southwestern Nigeria.

This study therefore sought to answer the following questions:

1. What are the preferred sources of information on food safety practices available to the rural households in the study area?
2. What is the food safety behaviour (knowledge, attitude and practice) of rural households in the study area?
3. What is the food-borne illnesses experienced by the rural households in the last six months?
4. What is the frequency of food-borne illnesses experienced by the rural households in the last six months?
5. What are the constraints to food safety practices by the rural household in the study area?
6. What is the health status of the rural households in the study area?
7. What is the food safety behaviour of the respondents across the selected states?
8. What is the health status of the respondents across the selected states?

1.3 Objectives of the study

The general objective of the study was to find out the contribution of food safety behaviour to health status of rural households in Southwestern Nigeria.

Specific objectives were to:

1 identify the preferred sources of information on food safety available to rural households in the study area;

2 determine the food safety behaviour (knowledge, attitude and practice) of rural households in the study area

3 determine the food-borne illnesses experienced by the rural households in the study area;

4 determine the frequency of food-borne illnesses experienced by the rural households in the study area;

5 ascertain the constraints to food safety practices experienced by rural households in the study area;

6 determine the health status of rural households in the study area.

7 ascertain the food safety behaviour of the respondents across the selected states.

8 ascertain the health status of the respondents across the selected states.

1.4 Hypotheses of the study

The following hypotheses are stated in null form.

H_{o1}: There is no significant relationship between the socio-economic characteristics of rural households and their food safety practices.

H_{o2}: There is no significant relationship between rural households' knowledge of food safety and the respondents' health status.

H_{o3}: There is no significant relationship between rural households' attitude to food safety and the respondents' health status.

H_{o4}: There is no significant relationship between rural households' food safety practices and the respondents' health status.

H_{o5}: There is no significant relationship between constraints to food safety practices by rural households and the respondents' health status.

H_{o6}: There is no significant contribution of food safety knowledge, attitudes and practices to the frequency of food-borne illnesses experienced by rural households.

H_{o7}: There is no significant contribution of food safety knowledge, attitude and practices (KAP) to health status of rural households.

Ho_8: There is no significant relationship between food safety behaviour and the respondents' health status.

Ho_9: There is no significant difference in food safety behaviour of the respondents across the selected states in the study area.

Ho_{10}: There is no significant difference in the health status of the respondents across the selected states in the study area.

1.5 Justification for the study

The importance of health in promoting economic development cannot be over emphasized. When households are better informed and educated on food safety practices, it will increase their knowledge on food safety which will influence their attitude for better food safety practices (WHO, 2016).

This study is important as to describe the knowledge, attitudes and practices of rural households with regard to food safety. Through such research, gaps in food safety knowledge among rural households can be identified in order to underpin the development of more specifically targeted and effective educational materials for such people, thereby reducing national morbidity, mortality and transmission of foodborne illnesses.

There are no regulations for the preparation, handling and storage of food at home, therefore an effective communication to inform consumers of the possible health risk of foodborne diseases and encourage safer food handling practices at home is probably the best way to ensure food safety at the consumer end of the food chain (FAO/WHO, 2013). The result of this research will guide the food safety authorities to develop an evidence based food safety education materials instead of simply adapt/ translate existing information materials.

This study is one of the very few studies which investigated the contributions of food safety behaviour to health status of rural households, therefore, this study will provide a base line information for implementing food-borne disease prevention and control strategies especially at household level. It will also serve as an input for policy makers to enact food legislation laws for health protection of consumers especially at household level.

Furthermore, the result of this research will provide evidenced base data for further studies and provide relevant contributions to knowledge.

CHAPTER TWO

LITERATURE REVIEW

2.1 Concept of food safety

Food safety according to David (2001), encompasses all the activities cum practices involved or explored from the point of production of raw materials and /or handling of farm produce down to processing, preservation and or final packaging with a focus of achieving food purity. In the same vein, FAO (2002), viewed food safety as the absence or acceptable and safe levels of contaminants, adulterants, naturally occurring toxins or any other substance that may make food injurious to health on an acute or chronic basis. However, WHO (2003), conceived food safety as a scientific discipline describing handling, preparation and storage of food in ways that prevent food-borne illness. This includes a number of routine that should be followed to avoid potentially severe health hazards. The tracks within this line of thought are safety between industry and the market, and then between the market and the consumers.

The National Policy on Food Hygiene and Safety practices, Federal Ministry of Health (FMH, 2009), defines food safety as an effort put in place by both marketers and producers to ensure that food consumed by consumers are of high quality and free from foodborne disease causing organisms. Taiwo (2012), corroborates this idea and define food safety practices as the presentation to man and animal, food which is wholesome, balanced and health giving and devoid of constituents that are dangerous or inimical to the continuous existence of the consumers. Similarly, Malcolm (2014), define food safety as 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. Fasoro *et al* (2016) see food safety as an integral part of food security and define it as measures taking to protect the food from microbial, chemical and physical hazards that may occur during all stages of food production, including growing, harvesting, processing, transporting, retailing, distribution, preparing, storing and consumption in order to prevent foodborne illness. In

essence food safety consists of all measures to ensure that food will not cause harm to the consumer when it is prepared and or eaten according to its intended use (WHO, 2015).

One can deduce from the above definitions that food safety encompasses all measures put in place at each level of the entire food chain in order to combat food contamination that can lead to health hazard.

2.1.1 Food Safety as a Global Health Issue

Food safety has emerged as an important global health issue with international trade and public health implications. It is a major concern among countries worldwide as it is affecting the economy in relation to lower work productivity, hospitalization and various health care expenses (WHO 2016). Additionally, food safety has become an increasingly important international concern as food contamination creates a huge economic burden on the communities and their health (Pal 2013). According to Abhishek *et al* (2012), food-borne diseases represent a widespread and growing public health concern across the globe with more impact on health and economy in developing countries than in the developed countries. For example, reports on food-borne outbreaks by WHO (2016), indicated that over 2 billion consumers in various parts of the world (i.e. US and Canada, Europe Australia, Asia, Africa, Middle East and Latin America/ Caribbean assume a common risk with regard to food safety. It further estimates that worldwide foodborne and water-borne diarrhea diseases taken together kill about 2.2 million people annually. Moreover it is also estimated that about 76 million people in the United States become ill from foodborne pathogens each year and that about 5,000 of these people die. In the same vein, the Centre for Disease Control (CDC 2011), estimated that about 48 million illnesses, 128,000 hospitalization and 3,000 deaths are the consequences of food-borne illnesses every year in the United States. Also in India, according to UNICEF (2012), an estimate of 400,000 children under 5 years of age die each year due to diarrhea. The Food Safety Asia (2010), reported that more than 700,000 people succumb to food and water-borne illnesses every year in the Asia Pacific Region.

FAO (2014), reported that the health and economic implications associated with lack of food safety is enormous. It reported further that the yearly economic cost of gastro enteritis

relating to medical expenses and in lost wages by sick persons or their care takers is estimated at millions of dollars in Australia and billions of dollars in the United States and United Kingdom.

It is also realized that the impact of food-borne diseases on health and economy is more in developing countries than in developed countries.

The above review shows the enormity of health hazards associated with lack of food safety. It equally shows that all over the world food-borne outbreaks do occur with its attendant health implications. There is therefore the need for government all over the world to take a pragmatic steps in order to reduce the level of food-borne disease outbreaks.

2.1.2 Principles/ Rules of food safety

Researchers in the area of food safety have identified several factors that can affect food safety adversely and therefore developed some principles/rules for food safety practices. These principles are based on the premise that food poisoning that can result from consumption of unsafe food are 100% preventable (WHO, 2007, CDC, 2014). These principles developed by WHO (2007), are usually referred to as “5 keys to safer food” are recognized as a standard way of producing and maintaining safe food. Maximum adoption of these 5 keys and their associated behaviours ensure consumer protection against food health hazard (WHO, 2007). The core messages of the five keys are given in Table 2.1

Table 2.1: Five Keys to Food Safety

Key message	Core information
Key one: Keep clean	• Wash your hands before handling food and often during food preparation. Wash your hands after going to the toilet • Wash and sanitize all surfaces and equipment used for food preparation • Protect kitchen areas and food from insects, pests and other animals
Key two: Separate raw and cooked food	• Separate raw meat, poultry and seafood from other foods • Use separate equipment and utensils such as knives and cutting books for handling raw foods. • Store food in containers to avoid contact between raw and prepared foods.
Key three: Cook thoroughly	• Cook food thoroughly, especially meat, poultry, eggs and seafood. • Bring foods like soups and stews to boiling to make sure that they have reached 70^{o}C • Reheat cooked food thoroughly
Key four: Keep food at safe temperature	• Do not leave cooked food at room temperature for more than 2 hours • Refrigerate promptly all cooked and perishable food preferably below 5^{o}c • Keep cooked food piping hot (more than 60^{o}C prior to serving). • Do not store food too long even in the refrigerator • Do not thaw frozen food at room temperature
Key five: Use safe water and raw materials for cooking	• Use safe water or treat it to make it safe • Select fresh and wholesome foods • Choose foods processed safely such as pasteurized milk • Wash fruits and vegetables especially if eaten raw • Do not use food beyond its expiry date

Source: WHO (2007) 5 keys to safer food

Similarly, the Centre for Disease Control and Prevention (CDC, 2014), reduced the above five safer keys to food safety as given by WHO (2007) to four keys usually referred to as '4Cs' to food safety. These 4Cs are:

- **Cleaning:** (kitchen surfaces after preparing food, kitchen utensils, use disinfectant);
- **Cooking:** (cook food to appropriate temperature, keep cooked food covered and piping hot before serving;
- **Avoid cross-contamination:** (keep raw food separate from cooked food and ready to eat food at all times, use separate knife and chopping boards for raw and cooked foods, wash hands after handling raw foods before touching other foods and utensils;
- **Chill:** (allow food to cool down before putting into refrigerator) (CDC, 2014).

It is believed that proper adherence to the above food safety keys through routine practices helps to avoid potential health hazards that may result from consuming unsafe food.

It is in line with this thought that Akagwu (2010), gave the following principles of food safety thus:

- Choice and purchase of the best available food,
- Storage of food under hygienic conditions and where appropriate at a suitable temperature;
- Care and cleanliness of premises, equipment and utensils;
- Personal hygiene and health of the kitchen staff;
- Adequate cooking and /or reheating of foods;

  This is achieved by keeping cooked food rigorously separated from every unwashed receptacle and implement that has been in contact with uncooked food (Akagwu, 2010). Similarly, in considering market to consumer food safety practices, *Jones et al*, (2009), posits that food ought to be safe in the market, this will ensure safe delivery and preparation of the food for the would be consumers. They noted further

that food can transmit diseases from person to person as well as serve as a growth medium for bacteria that can cause food poisoning.

The essence of the above food safety principles/rules are to ensure food safety at home and in the commercial food outlets.

2.1.3 Food Safety situation in Nigeria

According to Abu Norman (2013), consumption of unsafe food is a serious threat to public health in Nigeria for the last couple of decades. Consequently, many chronic and non-chronic diseases including diarrhea, cancer, heart diseases, various kidney diseases and birth defects are health hazards being experienced by people can be associated with consumption of unsave food (WHO, 2016). Research work on food safety situation in Nigeria conducted by the Food Safety Services (FSS, 2009) revealed the following:

- Thousands of people die every year as a result of food poisoning, and hospitals are filled with more patients suffering from food and waterborne diseases than other causes of illness. Most of them are women, children and travelers.
- Every human being eats food and drinks water everyday while few take drugs, but drugs are mostly taken care of more than food and water. The reverse should be the case.
- Presently, the nation's food markets have very poor sanitation and hardly one buys food that is wholesome. They sell food placed on the ground with dusts and flies, ants and cockroaches surrounding them.
- The street food vendors stay on top of smelling gutters and near refuse dumps to cook or fry food meant for public consumption.
- Some of the butchers sell meat from sick and dead animals and people suffer various types of diseases from them.
- Food traders keep foods and drinks under the sun which kills the nutritive values of these foods and drinks.
- Some people don't wash their hands with soap and water after touching money. They use the same hands to eat food e.g. groundnuts, garden eggs etc.
- Most of those who produce and sell food are illiterates and ignorant of food safety and hygiene.

- Many food vendors share the same shop with other traders like hair dressers, tailors, cobblers, thereby facilitating contamination of food.
- Children and many women are seen hawking food on roads, some of these foods e.g. bread, gala and sachet water fall on the ground when they are mining after passengers in these vehicles to sell their markets.
- Flies breed on meat, fish and crayfish in the markets as these are not covered.
- Many fruits and vegetables are sold on ground and near the roads and motor vehicles raise sands and dusts on them.
- Some women allow their young children to defecate in their kitchens where they are preparing food.
- Almost all bananas, plantain and mango sellers use carbides to make them ripe quickly. Carbide is a threat to life. Farmers should allow their fruits to ripe before taking them to the market.
- Some people use chemical agents on beans to kill or prevent the entrance of pests and when such beans enter the market the unsuspecting public buy it and die or become sick after eating such food.
- Worms and dysentery enter the body through food especially overripe fruits picked from the ground.
- Good food may be washed with contaminated water and this makes the food become poisonous or harmful to the body (FSS, 2009).

In addition to the above, Ekezie (2015) and Adegboye (2012), observed that there have been abuse and misuse of agro chemicals by farmers during storage. This have had serious health effects on people. Laboratory reports showed outrageous levels of organophosphate, carbonates, fenithothion and chloropyrifes which are highly toxic pesticides. This has led to reported cases of food poisoning after consumption of such foods. They equally observed that at the household level, some housewives have inadvertently fed their household unwholesome foods with some cases resulting in death or chronic diseases. This is as a result of poor personal hygiene, wrong choice of food material, poor purchasing power and ignorance on the effect of consuming some low cost foods.

Similarly, Al Shakkaf (2015), in his review of domestic food preparation practices found that most rural household food handlers prepare food in a poorly constructed kitchen or in the open space at the back of the house and in most cases, food preparation is carried out near open drains and garbage dumps which make the food so prepared potential health risks. Moreover, kitchen area may be poorly constructed or not available, drainage systems poorly constructed or not sanitarily kept and the environment poorly kept. He also observed that household food handlers handle food carelessly by not washing their hands before handling food, kitchen utensils not properly washed and cleaned. Bowls for washing hands and plates contain dirty water that are used many times before the water content is discarded for replenishment. Flies normally seen around the food site.

Another problem affecting food safety behaviour in rural household is unavailability of water especially during dry season. Oghenekhwo (2015), observed that this problem makes most rural household to economise the use of water, therefore such measures like washing of hands regularly when cooking food, washing of cooking utensils and kitchen surfaces are difficult to observe. This also affects personal hygiene of food-handlers as many of them are unkempt during food preparation. Furthermore storage of water is done in the pots/ drums or bucket/plastic container that may be dirty or not well clean. Moreover, most of these water container are not covered. Cups for drinking water may not be clean with people holding it with dirty hands, to scoop out water from the pots or drums. Most often, pots and drums are not washed before fresh water is added to the old water when need be. More importantly, water is essential in food preparation and in most cases unclean water are used in food preparation.

WHO (2016), also observed that preparation of meals which mostly takes place in open spaces around the house exposes the food to contamination before and after preparation since the environment cannot be controlled. Also, as majority (86.4%) of the population in rural areas still use firewood as their source of fuel, this can also cause environmental pollution affecting food and humans (WHO, 2016). This may be one of the reasons why cholera outbreaks are rampant in most parts of Nigeria.

WHO, further observed that many rural households lack refrigerator and where there is one, no electricity to make it function. Therefore storage of foods are done at ambient

temperature. However the most prevalent methods of food preservation used include sun-drying, smoking, frying and salting (WHO, 2016).

Generally speaking, simple rules of hygiene about the care of food and general sanitation are not observed or maintained. Food ingredients are left in the open in many homes with venom, flies and dust thus rendering them unwholesome (FSS, 2009).

Poor storage of foods at ambient temperatures for prolonged periods of time, inadequate cleaning of raw-material, use of utensils which may leach harmful heavy metals, inadequate cleaning of cooking and eating utensils, and storage of food at improper temperature cause rapid decomposition as well as an explosion of bacteria growth which can lead to dangerous level of microorganisms (FSS 2009).

Disposal of waste water and refuse inappropriately is almost a universal problem in most communities. All left-over waste materials are thrown into nearby gutters on the roadside, or on a heap of refuse dump in a nearby bush. The foul odour emanating from this refuse disposal is enough to cause disease outbreak, perishable foods are difficult to store as there are no freezers or refrigerators owned by most households, coupled with incessant power failure, hence foods are regularly invaded by flies, rats, cockroaches, rodents etc. Another factor is the traditional practices which determine the way food is handled and prepared in Nigeria. WHO (2016), further observed that some of these practices are deleterious to the health of the people, and the practices are oblivious of the role of germs in the causation of illness state

The above revelations show that Nigerians are in dire need of food safety education/information that will increase their knowledge, change their attitudes and practices for good health. In general, food safety principles were meant to ensure safety in handling, preparation, manufacturing, processing and storage of food in order to prevent any harm to the health of consumers. Additionally with lack of food safety resources especially in the rural areas, people will find it difficult to exhibit appropriate food safety behaviour.

2.1.5 Food Safety Policy and Regulation in Nigeria

Omotayo and Denloye (2002), observed that Nigeria like many other developing countries, faces the challenge of providing adequate food supply for its teaming population. To this end, policies and programmes aimed at boosting agriculture and food production are being actively promoted. However, the issue of food safety is another intimidating challenge with its attendant social, economic and health costs. It is the duty of every government to protect the society and community by providing rules and regulations which are known as laws. (Omotayo and Denloye 2002). In a study conducted by Ifenkwe (2012) on Food Safety regulation in Nigeria, it was observed that there had been considerable administrative provision for food safety in Nigeria over the years. Specific regulatory bodies and laws that have been established to ensure food safety in Nigeria include:

- The Public Health Law cap 164 (1917/1958);
- Standard Organisation of Nigeria (SON) Decree (1971);
- The Food and Drugs Decree, No. 10 (1988);
- Marketing of Breast Milk Substitute Decree No. 41 (1990);
- Consumer Protection Council Decree No. 66 (1992);
- National Agency for Food and Drugs Administration and Control (NAFDAC) Decree No. 15 (1999);
- The Counterfeit/Fake drugs/Unwholesome Processed Food Decree No. 15 (1999).

The leading food safety agency in Nigeria today is the National Agency for Food and Drugs Administration and Control (NAFDAC), which is charged with responsibilities of regulating and control of the manufacture, importation, exportation, advertisement, distribution, sale and use of all processed packaged food, water and other beverages in Nigeria (Edwards 2009). Action taken by NAFDAC in proven circumstances of violation includes burning of products and banning of such establishments from operating. Also in the fight against unwholesome products NAFDAC has conducted workshops on packaged water, fruit juices and other water-based drinks, runs public enlightenment jingles in English language in the network stations of Nigerian Television Authority (NTA) and

Federal Radio Corporation of Nigeria (FRCN), releases educative periodical publication of blacklisted companies who do not conform to certified healthy practices; reconstituted its legal unit for litigation against food safety offenders, and has held advocacy and solidarity meetings with law enforcement agencies (Ifenkwe 2012).

Apart from these, in recognition of the importance of food safety as an important factor for achieving high level of health for all Nigerians, the government launched the National Policy on Food Hygiene and Safety in the year 2000 as an integral part of the Nigerian National Health Policy. (Omotayo and Denloye 2002). The overall goal of this policy was the attainment of high level of food hygiene and safety practices which will promote health, control food borne diseases, minimize and finally eliminate the risk of diseases related to poor food hygiene and safety. The policy seeks to stimulate and promote legislations concerning food in areas of production, storage, handling, processing, preservation, trade, transportation and marketing. It also seeks to improve the quality of health care through ensuring that all food consumed in Nigeria whether locally produce or imported are wholesome, nutritious, free from contaminants and accessible to consumers at affordable prices (Omotayo and Denloye 2002). However, the need to revise, update and harmonize the existing legislations on food safety has been recognized, as some of them are outdated and do not accord with the current trends and advances on food safety. This made the Federal Government to call for stakeholders meeting to review the existing laws and policies on food safety in 2009 (FMH, 2014). Moreover, the Food Safety Control System has been undergoing review in order to update its key components along the food supply chain (FMH, 2014).

In addition to the above, food safety project started in Abia state in 1994 – 1997 by the Food Safety Organization in collaboration with the Royal Life Saving Society (Commonwealth Organisation) with the agreement of the state government. The programme was run on all the 17 local government areas of the state. The same programme was launched in Porthacourt in River state in the year 2000. Through this public private partnership, food safety training was done for all the food vendors in FCT in 2003 to prepare them for hosting the all Africa Games (Ihesuilo 2010). However, there was no programme for educating or sensitizing household food handlers on importance of food

safety. It is therefore necessary for the regulating bodies put in place by government to sensitise food handlers at household level on appropriate food safety behaviour.

2.1.5 Challenges to food safety systems in Nigeria

Ifenkwe (2012), in his review of food safety regulations in Nigeria, discovered that the high rate of foodborne disease incident in the country suggests that the regulation against unwholesome (fake, adulterated, sub-standard) food was to some extent being violated by food manufacturers and handlers. The food safety systems document of Nigeria situation revealed the following challenges for the nation food safety systems:

- Absence of risk analysis and hazard analysis cum critical control points approach to agricultural and manufacturing processes;
- Uncoordinated response to food borne epidemics and threats to food poisoning;
- Inadequate funding for the agricultural and research sectors of the economy;
- Poor collaboration among government regulatory agencies, academic, research institutes farmers, manufacturers and the consumers;
- Poor gathering, verification and dissemination of research data and information for its application at relevant points of the food safety system;
- Poor communication to consumers on the quality and safety features of a food product to guide informed choice through proper labelling.
- Lastly, national legislations and standards to enhance regulatory enforcements is lacking (Ifenkwe, 2012).

In addition to the above challenges, the FAO (2014), also found that majority of public health laboratories in Nigeria do not have the capacity to test foods for micro-organisms, chemical contaminants and naturally occurring toxins. Monitoring is carried out on ad-hoc basis during outbreaks rather than routinely. Also, food derived from biotechnology remain a challenge for governments especially in testing, regulating, appropriate labeling and providing adequate consumer information. However, this review and programmes did not consider food safety at household levels. This might be the reason why the nation is still battling with the problem of food-borne disease outbreaks. Therefore as a matter of urgency, Nigeria government need to strengthen information, education and communication of activities related to food safety in order to raise people's awareness on healthy foods and

safe food handling and preparation especially at household levels for better results in the control of food-borne illness outbreaks.

2.1.6 Household food safety behaviour globally

Household food safety behaviour measured in various studies include food safety knowledge, attitude and practices (KAP) of consumers with regards to proper food handling practices. According to Karen (2015), KAP survey is a demonstration study used to gather information from a particular population on what is known (K), believed (A) and done (P). Behaviour on the other hand has to do with a person's innate character. Kaferstain et al (2017), defines behaviour as the aggregate of response a person exhibit towards situations. Behaviour is formed by different factors some of which are willpower, knowledge and skill, attitude, social motivation, social ability, structural motivation and structural ability (Robertson, 2014).

Household food safety behaviour refers to preventive measures taken right from acquisition (purchase, storage, personal hygiene, cooking/food preparation and cross contamination) until consumption by the households which guards against contaminants and pathogens (Al Shakkaf, 2015).

Several researches have been conducted on food safety knowledge, attitude and practices of consumers. Notable among them was the study done by Guarayola et al, (2008) on relationship between consumer food safety knowledge and reported behaviour among students from health sciences in Spain. They found that 98.6% of the respondents recognize the importance of hand washing before and during food preparation but only 24.4% practice it. In another study on consumer food handling in the home conducted by Redmond and Griffith (2013), found that consumers do not practice food safety measures by the way they handle and prepare food at home. The reason why substantial proportion of food borne disease is attributable to improper food preparation practices in consumer's homes. In a research carried out by Can Farm Physician (CFP 2012), on pregnant women's food safety knowledge and practices found that pregnant women have limited knowledge on food safety and their food safety practices are somewhat unsafe.

Wilcock *et al* (2014), in their study on consumer attitude, knowledge and behaviour on food safety revealed that consumers' attitudes influence and predict behaviour. The study also highlights the diverse attitudes of consumers towards food safety. The diversity among consumers is based on variety of factors including demographic and socio-economic status. The study also revealed that different attitudes do not necessarily lead to behaviour that increase the safety of the food consumed. Abuga *et al*. (2017) in their study on consumers food hygiene and safety practices, found that consumers had positive attitude to handwashing with soap and running water during food preparation and keeping food surface clean prevents food contamination. However they showed negative attitude to using different knives and cutting boards for raw and cooked food. Study done by Nurhan (2007), on consumer food safety knowledge and practices in the home, (Turkey) found significant difference in the education levels and respondents' knowledge and attitudes towards food safety. However, there was no significant effect of demographic profile on food handling practices. In a study conducted on socio-demographic characteristics of food handlers' knowledge, attitude and practices towards food sanitation reported by Maizun and NyiNyi (2012), revealed that food handlers had good attitudes towards food safety practices though they did not practice accordingly during their daily activities. Their practice on hand washing, personal hygiene and safe food handling was poor.

Similarly, the study done by Mohamed and Sharma (2009), on food safety knowledge and practices of women in Egypt found that women have low levels of both food safety knowledge and practices. It was also revealed that 10.7% of the women have experienced food poisoning cases with the high proportion of cases (39.7%) in the age group less than 10 years.

The World Health Organisation (WHO 2007), report on community based intervention study of food safety practices in rural community households of Cambodia found that majority of food handlers do wash their hands with water before preparing food but few wash their hands after handling raw foods. Therefore there is the potential for spreading dangerous bacteria into other foods. Also only few food handlers use clean utensils, pets and pests were seen in the kitchen area. This gives room for the risk of food contamination by animals' present around. Some households also prefer to undercook their meats,

chicken and fish, and 1/3 of the households do not use clean safe water for cooking (WHO, 2007). Albishek *et al*. (2012), in their study on food safety related perceptions and practices among women working in North Indian, found that majority of the women have low levels of both food safety knowledge and practices. Social class and educational levels were found to be positively related to food safety knowledge and awareness.

In another study done in rural Ghana by Omari *et al*, (2014), found the following wrong food safety practices by the food handlers: washing of hands do not follow recommended hand washing procedure; engagement in practices that can promote cross contamination; improper reheating of left-over food; keeping food and left-overs at room temperature; inadequate protection of boreholes, streams, rivers and wells from microbial and chemical contamination; misuse of agro-chemicals and food additives (Omari *et al.*, 2014). Hui *et al*., (2017), found that out of the six constructs used to measure food handlers' knowledge of food safety, they scored highest in the construct of personal hygiene but scored poorly in the constructs of cross contamination, sanitation and prevention of foodborne pathogens.

On demographic characteristics that influence food safety behaviour, Abdullah and Siow (2014), found that educational level was positively related to attitude to food safety. Similarly, Mohd *et al*. (2015), in their study of food safety knowledge, attitude and practices of food handlers found that age and education were significantly related to food safety knowledge of food handlers. The level of knowledge on food safety increases with age and level of education. In addition to this, they also found that education was significantly related to food safety practices. Food hygiene was highly practiced among the educated food handlers.

One of the deductions from the above review is that, globally food handlers engage in inappropriate food safety behaviour due to lack of knowledge on food safety practices. Additionally, demographic characteristics of food handlers do influence their food safety behaviour either positively or negatively. Therefore, any intervention programme on food safety should fill this gap.

2.1.7 Household food safety behaviour in Nigeria

In Nigeria as observed by WHO (2016), vulnerability to food safety risks is primarily due to poor sanitation and inadequate drinking. Study conducted by Food Safety Service (FSS, 2009), revealed that food consumed as well as water used for drinking and food preparation had feacal contamination that can cause diarrhea diseases. Additionally, inadequate cooking and improper handling of cooking utensils were some of the households' food safety risks observed (FSS, 2009).

Ifenkwe (2012), in his study on compliance to food safety regulations in rural communities of Abia state, Nigeria, asserts that most kitchens, grocery stores and catering houses will fail abysmally if subjected to food safety and hygiene tests.

Oni, Oladele and Iredia (2015), in their study on consumers' willingness to pay for safety labels in bread found that people have low level of awareness on health risks associated with consuming bread with bromate.

Other studies done to assess food safety behaviour of food handlers in Nigeria, (Oladoyinbo and Awosika 2015, Bamidele *et al*. 2016, Omemu and Oloyede 2014, Sofela *et al*., 2014) uncovered poor knowledge, unfavourable attitude and poor hygienic practices among food handlers. Furthermore, where the food handlers have adequate knowledge and favourable attitude to food safety, this does not translate to appropriate behaviour in food safety (Osagbemi *et al* 2010).

In the review of literature done by Fasoro *et al.* (2016) the most common food safety behaviour in developing countries (Nigeria inclusive) that were associated with contamination of food with pathogens are: storage of food at ambient temperature for a long time usually more than 6hours; use of raw products with high level of pathogens; contamination with pathogens from hands; inadequate reheating of food in terms of temperature and or time; contamination with pathogens from utensils; inadequate initial cooking; leaving cooked food uncovered for cooling/storage and cross contamination from raw food to cooked food (Fasoro *et al*., 2016).Concerning relationship between food safety variables and socioeconomic status, Adewumi *et al*.(2014), found significant relationship between food safety knowledge, attitude and practices. Motta *et al*, (2014), found that lack

of food safety knowledge was associated with consumers' formal education, family size and income.

In conclusion, the findings above show that household food handlers engage in risky behaviour, this could lead to food-borne illness outbreaks at the household level. Therefore, efforts should be geared toward organizing awareness campaigns, education/sensitization on food safety principles and practices for home makers/food handlers. Government at all levels should take food safety as a serious business by strengthening food regulations and control and ensure compliance, in all cases. Moreover, our public health facilities should be strengthened especially at the local level in order to detect individual or sporadic outbreak of food borne disease quite early. This will reduce the incidence and prevalence of food-borne illnesses in Nigeria.

2.1.8 Food handlers and food safety issues

Food handlers play an important role in ensuring food safety throughout the chain of production, processing, storage, cooking and food preparation (WHO, 2015). Gaungoo and Jeewon (2013), asserted that the safety of food largely depends on the food handlers as they are crucial links in the food chain from farm to fork. Similarly, WHO(2015), noted that though numerous control strategies are in place for food safety practices, yet person to person disease transmission has not ceased. This outcome is partly due to mishandling of food and the disregard for hygienic measures on the part of food handlers (WHO, 2015). Moreover in a study done by Jai (2010), on food safety violation by restaurant workers, found that 62.8% of food safety violations were related to human factors while 37.2% were related to non-human factors. Mishandling of food plays a significant role in the occurrence of food-borne illnesses. Improper food handling by food handlers may be implicated in 97% of all food-borne illnesses associated with catering outlets and other settings including the home. WHO (2015), further stated that the mishandling of food and the disregard for hygienic measures on the part of food handlers, enable pathogens to come into contact with food in which they survive and multiply in sufficient numbers to cause illness in consumers.

Improper practices by food handlers which is responsible for microbial food borne illness have been well documented (Hui *et al*, 2017, Nesamvuni 2014, Gaungoo and Jeewan 2013), and typically involve cross-contamination of raw and cooked foodstuffs, inadequate cooking and inappropriate temperature for storing leftover food.

Another factor is the personal hygiene of food handlers. Hui *et al*. (2017), observed that lack of personal hygiene among food handlers is one of the most commonly reported practices that contribute to food-borne illnesses. Majority of food-borne illness outbreaks are as a result of transmission of pathogens to food from the food handlers hands (Hui *et al*,, 2017). They maintained that food handlers must have clean fingernails and that false finger nails should never be worn when handling food. False fingers trap debris which could become a physical hazard as they may lose their adhesiveness and break off into the food being prepared, thus contaminating the food (Hui *et al.*, 2017). Moreover, according to Dirks (2010), food handlers must also be aware of cuts and abrasions because they are sources of bacteria. Any food handlers who has infected wounds on the hands should not be allowed to handle food or touch kitchen utensils or equipment as this can transfer harmful bacteria such as streptococcus A. and staphylococcus aureus from the infected wound to the food or equipment (Dirks, 2010). WHO, (2012), established that personal hygiene and environmental sanitation are key factors in the transmission of food-borne illnesses throughout the world. Towards this end, Akintaro (2012), asserts that food-handlers need to acquire appropriate skills and knowledge in food handling skills. These skills are spelt out by Food Standard Organisation (2010) thus:

- Knowing that raw meat is likely to be contaminated with dangerous bacteria and that eating meat that is not well cooked can cause food poisoning.
- Knowing the cooking time and temperature needed to make sure that meat is thoroughly cooked
- The skill needed to check meat to make sure it is thoroughly cooked.
- Knowing the correct storage temperature for both raw and cooked food.
- They need to be skilful to make sure that equipment is set at the right temperature.
- Knowing that hands, gloves or the equipment used in handling can contaminate food.

- They need the skill to wash hands and equipment in ways that reduce the potential for contamination.
- Knowing about other things that could contaminate the cooked food such as dirty clothes or dirty work surfaces.
- Knowing that work area/environment where food is prepared is kept clean always. (FSO, 2010).

Although the above are meant for canteens and restaurants, yet they are also applicable to household food handlers but with some modifications.

Similarly, Hui *et al*. (2017) reported that infected food handlers were able to transmit pathogens responsible for gastro-intestinal infectious diseases via poor personal hygiene. According to Karen (2015), household food safety practices must hinge on hygienic handling and preparation of food, if food contamination and food poisoning would be prevented. He explains further that, food handlers must demonstrate hygiene in the following areas:

1. Personal hygiene: before preparing food, hair must be tie back, hands washed, nails scrubbed clean, hands washed with soap and clean water after using the toilet, never cough, sneeze, spit or smoke over food. Skin infections, cuts and grazes covered up, wear a clean apron, do not lick fingers or spoons and then touch food with it.
2. Food purchase: food items should be brought from clean reputable shop, buy fresh foods that are covered in the market place, chose fresh and wholesome food, purchase foods protected from dusts and flies.
3. Food storage: fresh foods should be stored in a cool place, and use them within the time frame, old stocks of dried and canned foods be used up before new ones, cool left-over foods rapidly and eat within 24hours, store food protected from flies, pests and rodents using muslin cloth, plastic film or a food net.
4. Kitchen hygiene: kitchen surfaces wash and clean regularly as well as the cooker and the floor, keep utensils clean and well stored when not in use, wipe up spills as they occur, do not allow pets to sit on work surfaces or to eat from utensils and dishes that will be used for humans, rinse out dish cloth after use and air dry and

disinfect regularly, use hot water and a good detergent for washing dishes to remove all food traces, cook poultry, beef, fish to appropriate temperature.

5. Waste disposal: keep dustbins well away from the kitchen in a cool shaded position protected from flies, cats and vermin, disinfect dustbin regularly, empty kitchen bins every day and wash out, disinfect sink regularly to kill germs and prevent it from being clogged (Karen, 2015).

Another important area where food handlers can also serve as infectious agent is in relation to their health status. WHO (2015), asserted that majority of food handlers at household level do not undergo medical examination to ascertain their fitness at home, and that many people look healthy but they are reservoir of infections (WHO, 2015).

In conclusion, food handlers play a crucial role in the prevention and control of food related diseases since all hygienic measures involved in food production, storage and distribution can be negated by poor food handling practices on the part of food handlers.

2.1.9 Sources of food safety information

Most people obtain food safety information from various sources ranging from television, newspaper, government publications food packaging/labels, radio, friends and family neighbours, social media etc. Maughan *et al*. (2016), noted that food handling practices are often handed down in families from generation to generation much as family traditions are. Children learn a great deal about daily life from their parents and food handling and preparation are not exceptions (Maughan *et al*., 2016). Similarly, Byrd-Bredbenner *et al*. (2013), found the home to be an important source of food safety knowledge. Families were found to be a reliable source of food safety information. In a gender study done by Maughan *et al*. on food safety knowledge of university students in Sweden found that girls consider their mothers as the most important and trusted source of food safety knowledge. This suggests that the home remains a place for transferring domestic knowledge although this is decreasing due to lifestyle changes (Brd-Bredbenner *et al*., 2013). Similarly, Osagbemi (2010), found that 81.6% of the respondents obtain food safety information from family members, 62.1% from friends while others used television, radio, school. Print had the lowest usage. However, Lazon *et al*. (2012), opined that, the home may not be the

optimal place for transferring food safety knowledge and that the school curriculum should incorporate food safety education for students.

In another study done by Newman (2016), on sources of food safety information among students in Sweden, found that boys acquire food safety knowledge from their father. Boys found their fathers to be a trusted source of food safety knowledge. This was so because men in Sweden cook more frequently as many of them live as single parents.

The internet is perceived as not a reliable source as it is difficult to separate information on food safety from subjective opinion (Manghan *et al*. 2016). However, in a Canadian study which evaluated 116, 30 minutes television cooking shows found 13 unsafe food handling practices (Chapman *et al*. (2004). Similarly, in a study done by Irlbeck (2007), of five popular television working shows found a total 460 poor food handling practices. Both studies shows that food safety knowledge cannot be adequately acquired on the television or internet as not every food safety handling practices can be performed or discussed because of time restraint. However, Lisa *et al.* (2014), found that North Americans rely on television as one of their primary sources of food safety information, followed by newspaper articles, food packaging labels and government publications.

The use of social media to share food safety information among consumer is currently low. In a study done by Henderson *et al.* (2010) on media analysis and consumer trust concerning food safety and nutrition, found that trust in media reporting on food safety issues was limited, while medical professionals are considered a reliable source of information about food risks and healthy eating.

Overall the results show that a variety of channels to communicate food safety messages could be utilized. However, television and radio remains an important source of information on food safety for adults while social media, phone and internet appears to be more pertinent method for communicating with children and young people.

2.1.10 Constraints to Food Safety Practices at Household Level

The World Health Organization (WHO, 2007), report on a community based intervention study on food safety practices of rural households found the following constraints to food safety behaviour modification by rural households thus:

Education: literacy rates in rural areas are low, this reduces the effectiveness of written/printed materials that provide information to families about safe food preparation, water handling and personal hygiene. Education provides knowledge of the nature and value of different foods. This provides the basis for choice, and people without this knowledge may choose unwisely for health (WHO, 2007).

Other constraints are tradition and custom of people. Family meal custom which are deeply rooted in beliefs and habits developed over generations may prevent families from obtaining the food that they need. For example, in a study conducted in Hanoi by Australian Centre for International Agricultural Research (ACIAR, 2014), revealed that people's traditional food preparation methods put them at high risk of spreading contamination from raw pork to other foods. Also their custom permits eating raw meat and fish.

The physical environment where people live is another factor that put them at risk of food borne illness. This may be due to overcrowding of households. The kitchen may not be spacious enough, pets and pests may be seen around the kitchen area. Waste may even litter the surroundings due to lack of waste disposal provision (WHO 2007).

Poverty also prevents people from practicing recommended food safety practices. Poor financial status may subject people to purchase unwholesome food. Also people of low income groups are easy victims of poor nutrition.

Taboo and superstition can present a constraint to food safety choices. For example it is a taboo for pregnant women to eat snail. Cumbersome nature of food safety practices may put some households off.

Omemu and Oloyede (2014), observed that lack of infrastructural facilities especially in rural areas (for example electricity, pipe-borne water, storage facilities, waste disposal etc.) is another big problem that can serve as constraint to food safety practices by people

Similarly in a cross sectional study of physical environment and hygiene status of food establishment in Malaysia done by Pallavi *et al*, (2015), found that lack of basic infrastructure and knowledge of hygiene, use of unhygienic materials, lack of proper storage facility and proximity of food environment to sewers and garbage dumps cum poor sanitary practices are major constraints to food safety practices. Lack of time due to household chores was another barrier to hand washing during food preparation. In a study done by Cochran-Yantis (2016), on factors that influence food safety practices of food handlers, found that time pressures are the major factors that influence food safety practices such as washing of hands, cleaning food preparation surfaces, checking temperature, cooling and reheating of food.

In conclusion, these constraints need to be adequately addressed in order to aid food safety practices by rural dwellers.This will go a long way in changing people's age long held beliefs, attitudes and practices that are detrimental to their health.

2.2 Concept of foodborne illness

The Centre for Disease Control and Prevention (CDCP, 2013), uses the term foodborne illness to describe any disease that is carried or transmitted to human being by food or beverages. In the same vein, WHO (2015), define food borne illnesses as diseases of infectious or toxic nature caused by consumption of contaminated food or water. The United State Department of Health and Human Services (USDHHS,undated) defined foodborne illnesses as the infection or irritations of the gastro-intestinal (GI) tract caused by food or beverages that contain harmful bacteria, parasites, viruses or chemicals. The common symptoms being vomiting, diarrhea, abdominal pains, fever and chills. According to Addis and Sisay (2015), foodborne illnesses are classified into two broad groups namely intoxication and infection. Intoxication is caused by ingestion of toxin produced by pathogens while infection is caused by ingestion of food containing viable pathogens. Most foodborne illnesses are acute, that is they happen suddenly and last a short time and most people recover on their own without any treatment. However foodborne illness may lead to more serious complication (USDHHS, undated).

In conclusion, food-borne illness come as a result of consuming food/water containing pathogen and its toxins.

2.2.1 Pathogens responsible for foodborne illness

Food safety experts have identified five food-borne pathogens which are easily transmitted through foods and causing severe illnesses. They are Salmonella, Shigella, Enterohemmorhagic or Shiga-toxin and Hepatitis A virus (FDA, 2010).The most common causes of food-borne illnesses are micro-organisms most especially bacteria, viruses and moulds. Other agents are parasites (worms), naturally toxic foods and chemicals. Bacteria, viruses and ova of parasitic worms are responsible for the contamination of food materials (WHO, 2006). These organisms and ova of parasitic worms make food unsuitable for human consumption. They introduce toxins into human bodies (because they are pathogens) following the consumption of food in which they are present thereby causing diseases. On the other hand, some of these organisms may not cause any diseases on their own but they produce heat stable toxins which survive even after the bacteria themselves have been destroyed by heat treatment. Among the notorious disease causing toxins are streptococci which often inhabit the human skin and throat thereby causing boils and sore throat. The ova of parasitic worms are transmitted through contaminated food into man which when they hatch out into micro-organisms like tapeworms and trichiniasis (Akagwu, 2010). The Food and Drug Administration of United States of America (FDA, 2010) have identified five major food-borne pathogens of bacteria and virus origin whom experts recognized as being transmitted through food causing severe illnesses. These pathogens are designated as the “Big 5” they are: Norovirus, Salmonella, Shigella, Enterohemorrhagic or Shiga-toxin producing *E. coli* and Hepatitis A virus.

Food-borne bacteria such as salmonella is usually found in potentially hazardous foods such as poultry, meat, unprocessed milk, eggs and water, especially when appropriate conditions and nutrients that accommodate bacterial growth are present (Rutherford, 2010). However, viruses such as *E. coli* only multiply in human or animals and can survive on hard surfaces for a number of days or weeks. Any contact made with the contaminated surfaces can result in the transmission of these viruses to cross-contaminate other surfaces and ready-to-eat foods (FDA, 2010).

Another food contaminant that is also recognized by food safety experts is mould. Food that is contaminated with mould often looks safe to eat as only the outer part is affected by mould growth. However, substances produced by the mould may migrate into the food and be harmful to many organs of the body. These substances are called mycotoxins. It is therefore advisable to discard mouldy food completely rather than just to remove the mouldy part. Mould growth can be prevented by cool dry storage, heating to destroy moulds and spores and in acidic condition (Gates, 2011).

Yeasts are another microscopic single-celled fungi which are found in the air and soil and on the surface of fruits. Yeast can spoil foods such as jam and fruits by fermenting the sugars to produce alcohol and carbon-dioxide gas (Gates, 2011).

The above review help us to know the pathogens responsible for food contamination and the potentially hazardous food. With this knowledge one can take appropriate measure to prevent food contamination right from purchase of food items and to cooking of food.

Table 2.2 shows common causative agents of foodborne illnesses, clinical features, possible contaminants, diagnostic procedures and steps for prevention.

Table 2.2 Causative agents, clinical features and preventive measures for common foodborne illnesses

Organism	Incubation period	Clinical Features	Possible contaminants	Laboratory diagnosis	Preventive measures
Bacilius cereus	30 min to 15 hours	Sudden unset of nausea and vomiting, abdominal cramps with or without diarrhea	Cooked but not properly refrigerated foods such as vegetables, fish, rice etc	Stool test, food sources may be tested	Careful attention to food preparation, cooking and storage standards
Brucella sp	7 to 21 days	Fever, night sweat, back-ache, muscles aches, diarrhea	Unpasteurized dairy foods and meat	Serology, blood culture.	Consumption of pasteurized dairy product, cooking meat thoroughly
Cmpylobacter jejuni	1 to 7 days	Fever, head-ache, nausea, abdominal cramps, diarrhea	Raw and undercooked poultry, eggs, raw beef, contaminated water	Stool culture, rapid immune-chromogenic tests.	Pasteurization of milk, cooking food properly, prevention of cross-contamination
Cnoscridium bocunum – preformed toxin	12 to 72 hours	Abdominal cramps, nausea, vomiting, diarrhea, blurred vision, head-ache, dryness of mouth, muscle paralysis, respiratory failure, nerve damage.	Inappropriately canned foods, meat, sausage, fish	Detection of botulinum toxin in serum, stool or patient's food	Proper canning of foods, proper cooking of foods
Clostridium perfringen-toxin	8 to 22 hours	Nausea, abdominal cramps and diarrhea	Meat, poultry, inadequately reheated foo.	Stool test for enterotoxin	Maintenance of proper cooking temperatures
Cryptosporidium sp	2 to 20 days	Nausea, loss of appetite, watery diarrhea, mild-	Undercooked food or food contaminated by sick food handler,	Stool test for detecting oocysts by modified acid-	Avoidance of contaminated water or food, washing hand after using the toilet and handling food

		abdominal cramp	contaminated water or milk	fast stain.	
Cyclospora cayetanensis	1 to 24 days	Watery diarrhea, abdominal cramps nausea, anorexia and weight loss	Fresh fruits and vegetables	Stool test for detecting oocysts	Hygiene practices in the agricultural setting and in the individual environment
Entero-hemorrhagic E. coli 0157; H7 and other shiga toxins	1 to 8days	Bloody diarrhea, vomiting, abdominal cramps, fever, hemorrhagic colitis	Undercooked ground beef, unpasteurized milk, raw fruits and vegetables	Stool culture for isolating the organisms	Cooking meat thoroughly, prevention of cross contamination
Hepatitis A virus (HAB)	15b to 50 days	Anorexia, nausea, abdominal, discomfort, jaundice dark coloured urine	Consumption of contaminated water of foods	Serum test for Alanine	Washing hands after using the toilet and before preparing food
Listeria monocytogenes	2 days to 3 weeks	Nausea, diarrhea, fever, muscular pain, meningitis	Unpasteurized milk, cheese prepared with unpasteurized milk, vegetable and meat	Blood culture	Pasteurization of dairy products cooking foods properly prevention of cross contamination
Noroviruses	Between 12 and 48 hours	Nausea, vomiting, diarrhea, abdominal cramps, headache and fever	Raw food product, contaminated food or drinking water	Stool culture, nucleic acid hybridization.	Proper sewage disposal, waste chlorination, restricting infected food handlers from handling food.
Samonella sp	Non typhi 1to 3 days Typhi 3 to 60 days	Nausea, diarrhea, abdominal pain, fever, headache, loss of appetite	Contaminated egg, poultry, meat and pasteurized milk, dairy foods, raw fruits and vegetables	Stool culture and blood culture.	Cooking food thoroughly, prevention of cross-contamination.
Shigella sp	12 to 50 hours	Vomiting, , diarrhea with blood, abdominal pain and	Contaminated food or drinking water. Raw	Stool culture.	Practicing proper washing and hygiene techniques in food preparation.

		fever	vegetables, salad and poultry		
Staphylococcus aureus	1 to 6 hours	Nausea, vomiting, abdominal pain fever and diarrhea	Inappropriately refrigerated food such as meat, salad, poultry	Stool or vomitus test for detection of toxin.	Refrigerating foods properly using hygienic practices.
Vibrio cholera	4 hours to 4 days	Severe watery diarrhea, abdominal cramps, Nausea, vomiting, fever death may occur	Contaminated water, selfish and crustacean	Stool culture.	Cooking food thoroughly.
Vibro parahaemolyticus	2 to 48 hours	Watery diarrhea, abdominal pain, nausea and vomiting.	Raw or undercooked seafood from contaminated seawater	Stool culture	Cooking food thoroughly, practicing hygienic techniques in food preparation and storing food at the appropriate temperatures
Yersinia enterocolitica	1 to 3 days	Diarrhea, vomiting, fever and abdominal cramps	Contaminated meat and milk, undercooked pork and contaminated water	Stool culture, blood culture	Pasteurization of milk, cooking food thoroughly, prevention of cross contamination, practicing hygienic techniques in food preparation.

Source: Iowa State University, 2010; Linscott, 2011).

2.2.2 Global burden of foodborne illness

The World Health Organisation (WHO, 2015) asserted that foodborne diseases have been an issue for all societies since the beginning of humanity, however, the types, severity and impacts of these illnesses have changed through the ages and are still diverse across regions, countries and communities. It is a worldwide major health burden leading to high morbidity and mortality (Addis and Sisay 2015). WHO (2015), further observed that the burden of foodborne disease is not well defined globally, regionally or at country level this is because the estimate burden of food borne diseases are complicated by the fact that very few illnesses can be definably linked to food. For example, most common clinical symptoms of foodborne illnesses are diarrhea, vomiting, abdominal cramps, headache, nausea and fever, which in most cases are not linked to unsafe food consumption. However, WHO further noted that foodborne diseases are among the most widespread public health issues killing about 2.2 million people annually and costing hundreds of billions of United States dollars for governments, companies, families and consumers. The current estimates of 2.2 million deaths only represent the tip of an iceberg (WHO 2015). Out of this death estimate, 86% are children of under 5years of age.

It is also estimated that every year 76 million people in US become ill from pathogens in food with about 5000 death cases recorded (WHO 2015). Also in a recent study conducted by WHO (2013),found that 31 global food hazards caused 600 million food-borne illnesses with 420,000 deaths and 33 million disability adjusted life years (DALYs) in 2010. In 2001, over 600 foodborne outbreaks in America Institutions were recorded. Also in developing countries, up to 70% of cases of diarrhea disease are associated with consumption of unwholesome food (WHO, 2015).

The Center for Disease Control (CDC 2011), also reported that the highest burden of food-borne diseases per population was observed in Africa. They observed that in African region there is high incidence of diarrhea among newborns and young children, as well as frequent outbreaks of acute poisoning and cholera. It is estimated that in Africa 3.3 to 4.1 million incidence of both food and water-borne illnesses do occur yearly which accounted for between 450,000 to 700,000 deaths in children annually with many more sporadic cases not recorded (CDC, 2011). Similarly, WHO (2015), observed that foodborne illness has a health burden similar to malaria, HIV/AIDS or

tuberculosis with 98% fall on developing countries and on 40% of children under 5years of age. Developing countries like Nigeria are more at risk of food-borne disease outbreak because of faulty food practices, presence of vast number of food-borne pathogens. Generally, the report of foodborne outbreaks indicate over 2billion consumers in various parts of the world that is United State, Canada, Europe, Australia, Asia, Africa, Middle East and Latin America/Caribbean (WHO, 2015).

On the economic impact of food-borne illness, effort to quantifying this is very recent even in developed countries, however, WHO (2010-2015) foodborne epidemiological survey revealed that the economic cost of foodborne illnesses is high affecting the United State pocket book at a cost of $50 to $80 billion annually in health care cost, lost productivity and diminished quality of life. Costs arise from a number of different sources and are incurred both by individual and by society at large. These costs include the following as noted by WHO (2015) thus:

- Loss of income by the affected individual;
- Cost of health care;
- Loss of productivity due to absenteeism;
- Costs of investigation of an outbreak;
- Loss of income due to closure of businesses;
- Loss of sales when consumers avoid particular product

Similarly, Bank (2007), affirmed that poor health resulting from foodborne illness reduces income and productivity in agricultural communities which further decreases people's ability to address poor health and inhibiting economic development. This is as a result of lack of food hygiene, lack of surveillance systems, widespread poverty which is the underlying cause of consumption of unsafe food. Other factors are lack of access to clean water, weak government structure, population growth and poor environmental condition. (CDC 2011).

In developing countries, WHO (2014), assert that developing countries are more prone to suffer from food-borne illnesses because of multiple reasons ranging from lack of access to clean water for food preparation, inappropriate transportation and storage of food, lack of awareness on safe and hygienic food practices, limited capacity to implement rules and regulations regarding food safety, lack of effective surveillance

and monitoring systems for food-borne illness outbreaks, inspection systems for food safety and educational programmes regarding awareness of food hygiene (WHO, 2014).

The above review shows the enormity of the global burden of food-borne illness on the individual, society and the nation at large, efforts should therefore be geared towards reducing its negative impact on people's health.

2.2.3 Foodborne illnesses in Nigeria

Odeyemi and Bamidele (2016), affirmed that in developing countries in which Nigeria is one, most foodborne illness outbreaks are underreported or under-estimated. They went further to ascertain this by comparing Nigeria who has over 170 million people, and only 90,000 cases of foodborne illnesses reported annually, with Australia which is a developed country with just 24million people, which is equivalent to 1:7 when compared to Nigeria population yet more than 5.4million people are reported having foodborne illnesses annually, despite the high standard of living, good water supply, proactive government initiatives and measures on food safety. They therefore deduced that at least 36 million people (7×5.2) are possibly affected by foodborne illnesses in Nigeria every year. Similarly Nigeria, as reported by Sylvester and Craig (2013), has insufficient data and official record with poor surveillance systems on foodborne outbreaks. Consequently, few cases of food poisoning resulting in deaths and hospitalization are reported. However, evidence abound that foodborne illness contribute to ill-health and death in the country (WHO, 2017). The Nigeria Health Watch (NHW, 2018), reported that in a review study of 14 public hospitals in Lagos between 1999 -2008 identified 80,000 cases of Salmonella diseases and 800 deaths. Cholera is another major foodborne and water-borne bacterial disease with over 70,000 cases and 3,000 deaths between 2010 and 2013 (NHW, 2018).Amongst these cases are outbreak of food poisoning in Ibadan, which claimed about 20 lives. Food poisoning among three families in Kano and five families in Ilorin due to yam flour consumption.

Moreover, reports from news agency of Nigeria reveals the following major outbreaks. In January 2009, three people were reportedly killed and three hundred and fifty others hospitalized due to suspected outbreak of cholera at Dokogi village in Niger state. Also in January 2009, no fewer than 27 children between the ages of 4 and 10 years were reported dead as a result of suspected outbreak of severe gastro-enteritis (otherwise known as cholera) in Ndiagu- Anagu in Ikwo local government area of Ebonyi state. In

addition to this, 41 children died of gastro-enteritis in another community in the same Ebonyi state due to intake of contaminated water.

In August year 2009, a cholera outbreak claimed 52 lives in Adamawa state, Northern Nigeria, with scores of people also hospitalized. In September again, in Adamawa state no fewer than 79 persons were confirmed dead from a suspected outbreak of an epidemic of cholera in about seven local government areas of Adamawa state, with 846 persons being hospitalized at various health establishments. In Taraba State, in September, 2009, it was reported that nine people died and several others were hospitalized following a choleras outbreak. Likewise in Jigawa eleven people died following the outbreak of cholera in Bashin village.

In Borno State, 149 out of 650 people who were infected with bacteria leading to cholera outbreak died.

Also in October and November 2009, there was fresh cholera outbreaks which claimed about 97 lives out of 200 people that were infected in Adamawa state. In 2010, 6 people died while 78 were hospitalized due to cholera outbreak in Opobo town in Opobo/Naro local government area of Rivers State. In 2011, both Oyo and Osun states had cholera outbreaks which claimed 12 lives while 16 people were hospitalized.

In June, 2013, the Federal Ministry of Health (FMH) reported 22 cases of cholera, with 7 cases reported in Kwara State, 15 cases in Kaduna and Zamfara states, with no death record. In the same years 104 cases of cholera endemic were confirmed in Ogun State.

In the year 2017, it was reported that cholera killed 184 persons in 8 states across the country. Cholera situation reports indicated that there were 8,241 suspected cases of the disease imparts of the country. In the same year, there was a 5 month long cholera outbreaks in Nigeria's conflict affected areas of Borno State which resulted in no fewer than 23 deaths and 53 suspected cases. Also in one of IDPs camp in Borno State there were 152 suspected cases of cholera with 11 deaths. The causes of these outbreaks were connected to poor sanitation, lack of access to clean drinking water and poor hygiene condition.

In summary from 2010 – 2013 cholera epidemic stood at 41,787 cases and 1,716 deaths. Since then, Nigeria has been experiencing recurrent outbreaks of cholera (FMH, 2013).

In 2014, according to the Cholera Regional Platform, Nigeria was the most affected country by cholera in West and Central Africa with 35,996 cases representing 39% of all cases in the region (IFRC, 2016).

Typhoid is another food borne illness which is caused by bacteria. The general symptoms are fever, headache, constipation, loss of appetite, nausea, diarrhea vomiting and abdominal rash. It is usually transmitted by the ingestion of food/water contaminated with faeces of an infected person (Akintayo, 2014). Akintayo gave the summary of typhoid fever in the country thus:A total 104,154 cases of typhoid were recorded in 2002, followed by 77,850 in 2003 and 39,337 in 2004. However, from 2005 to 2008 there was no available data. Typhoid cases ranked highest from the year 2002 – 2008. Similarly, Ihenkuronye, (2010), affirmed that an estimated 200,000 deaths is credited to foodborne and diarrheal diseases yearly in Nigeria.

The above show the extent of food-borne illness outbreaks in Nigeria, the available figures may even be underreported due to lack of surveillance by relevant stakeholders. This calls for strengthening of the food safety system of the country for proper monitoring at every level of the food chain in order to reduce the level of food-borne illness outbreaks.

Table 2.3 shows the summary of foodborne illnesses in Nigeria from January to December 2012 according to Federal Ministry of Health (FMH 2014).

Table 2.3: Foodborne disease related cases and deaths in Nigeria, January-December, 2012.

	Diseases Type	Cases (yrs age)	Cases >5 yrs	Deaths < 5 yrs	Deaths > 5 yrs	Total cases	Deaths
1.	Cholera	458	1,012	15	38	1470	45
2.	Diarrheal (without blood)	642,024	25,579	951	8	667,603	959
3.	Diarrheal (with blood)	127,620	99,904	222	178	227,524	400
4.	Typhoid fever	50,227	375,664	288	474	425,891	762
5.	Lassa fever	307	1,697	3	56	2,004	59

Source: Federal Ministry of Health (FMH, 2014)

2.2.4 Food safety behaviour responsible for foodborne illnesses

Consumer food handling behaviour in the home is crucial in preventing food-borne illness outbreaks. Although the total number of infections caused by food prepared at home is not known, however evidence support the assertion that consumers play a critical role in the prevention of foodborne illness (CDC.2011). Also data from Centre for Disease Control report private homes as the second most common location associated with outbreaks of foodborne illness. They noted further that pathogens may be introduced to the domestic environment via naturally contaminated raw foods, transfer from environment (carried by animals or insects) or transfer from another person (faecal-oral contamination). In the same vein, Akagwu (2010), noted that very often, food items brought into the kitchen, (processed or cooked food) from street hawkers and food sold in restaurants may all contain their own contaminations resulting from the hygienic standards of the people who handle them as well as the conditions and manner in which they are slaughtered, processed, stored, cooked and distributed. She said further, that food processors and cooks introduce into food potential poisons called food additives. They do this in order to ensure appetizing taste and appearance. These additives are either preservatives, sweetening agents, colouring agents and seasoning. A popular synthetic seasoning called “white magi” in Nigeria among the illiterate Pidgin English speakers is known to contain substances that are dangerous to health. There are other forms of additives which are also known to cause cancer in humans in later years after consumption (Akagwu, 2010).

Another human behaviour that can lead to food-borne illness is the use of infected or spoilt food ingredients in private homes due to low income by households. At times some of the meat sold in the markets may be those of sick or dead animals bought from a neighbour or somewhere else, as this kind of meat will be cheaper than buying healthy animals for slaughter.

Other sources of food poisoning are the food handlers themselves, Pyke (2009), noted that food handlers in abattoirs, kitchen, factories shops and restaurants are at times pose serious health hazards to consumers. They are a prominent source of some food poisoning. The risk of food getting contaminated depends largely on the healt0.h status of the food handlers, their personal hygiene, knowledge and practice of food hygiene. For example, scratching of infected skin during food preparation, nose blowing,

sneezing, spitting, coughing etc. are major sources of food poisoning and infection (State Ministry of Health Manual, 2010).

Besides human, animals commonly called pet animals, dogs, cats, other pests like rats, rodents, cockroaches, flies etc. act as host for some worms, for example dogs, act as hosts for the adult stage of tapeworm, thereby help in transferring the worms' eggs into food eating by man. Improper dispose of waste food materials may also facilitate the spread of harmful organisms into food environment (Akagwu, 2010).

Another source is from water used in cooking and food preparation. It is known that natural waters contains not only their natural flora but also microbes from soil and at times from animals and sewage. In rural areas, there are two main sources of water used by the people these are water from streams and wells. Contamination may come from water used as ingredients for washing foods, for cooling heated foods and manufactured ice for preserving foods (Oloyede, 2014). Foods from soil laden water, sewage polluted water can contaminate the food with all kinds of disease carrying pathogens. Therefore, a safe and portable drinking water should conform to the following water quality characteristics as given by Oyo State Ministry of Health viz; free from pathogenic organizers, low in concentration of compound that are actively toxic, clear, not salty, free of compounds that cause an offensive taste or odour and lastly non corrosive.

Air is another contaminant. Microorganisms get into the air by accident either in suspended solid materials or in moisture droplets. They get to the air on dust, dry soil and spray from streams, lakes or oceans, droplets of moisture from coughing, sneezing or talking. The contamination of food through the natural sources discussed above may take place before the food is harvested or gathered or during handling and processing of the food (Oloyede, 2014).

In the investigation of food-borne illness outbreaks the Centres for Disease Control and Prevention (CDC, 2010), has identified three major contributing factors that lead to foodborne illness outbreaks. The three factors are (1) factors that allow pathogens to survive in the food, (2) factors that allow proliferation of bacterial pathogens, and (3) contaminating factors.

Among the factors that allow pathogens to survive in the food include insufficient time and temperature during initial cooking and heat processing (Cochran-Yantis, 2016). For

example meat or poultry that is under cooked and consumed can directly introduce Salmonella which is a food-borne pathogen to the consumers' digestive system causing diarrhea, nausea and vomiting. In an acute condition, where the bacteria enter the lymph tracts and contaminate the blood system, the consequences can be much more severe and even fatal (Rutherford, 2010). Time and temperature abuse can also facilitate the growth of bacterial in foods especially when foods are allowed to remain at room temperature for several hours, inadequate cold-holding temperature or insufficient time and temperature during hot-holding (Greig *et al.*, 2007, and NRAEF, 2004).Research shows that over 50% of food-borne outbreaks are associated with inadequate cooking and improper holding of food (WHO, 2008, Goh, 2007 and Gregoire and Spears, 2007). In general, temperatures between 41ºC and 135ºF (considered as food danger zone) allow pathogenic microorganisms to multiply (Health Link BC 2016). Unsafe behavior of food handlers are known to contribute approximately 97% of food-borne illnesses in food establishment and homes (Griffith and Items, 2008).

These improper food safety behaviour according to MsSwane, Rue, Linton and Williams (2014), are lack of personal hygiene, improper cooking, cross contamination, keeping food at unsafe temperatures and purchasing food from unsafe sources. Research studies show that poor personal hygiene causes more than 90% of food-borne illnesses. Improper hand-washing alone account for more than 25% of all food-borne illnesses (Weinstein cited by Angolo, 2011). Moreover, over three million cases of food-borne illnesses annually are attributed to pathogens associated with inadequate cooking of food (MsSwane *et al.*, 2014).Below is the graphical representation of sources of contaminants in food.

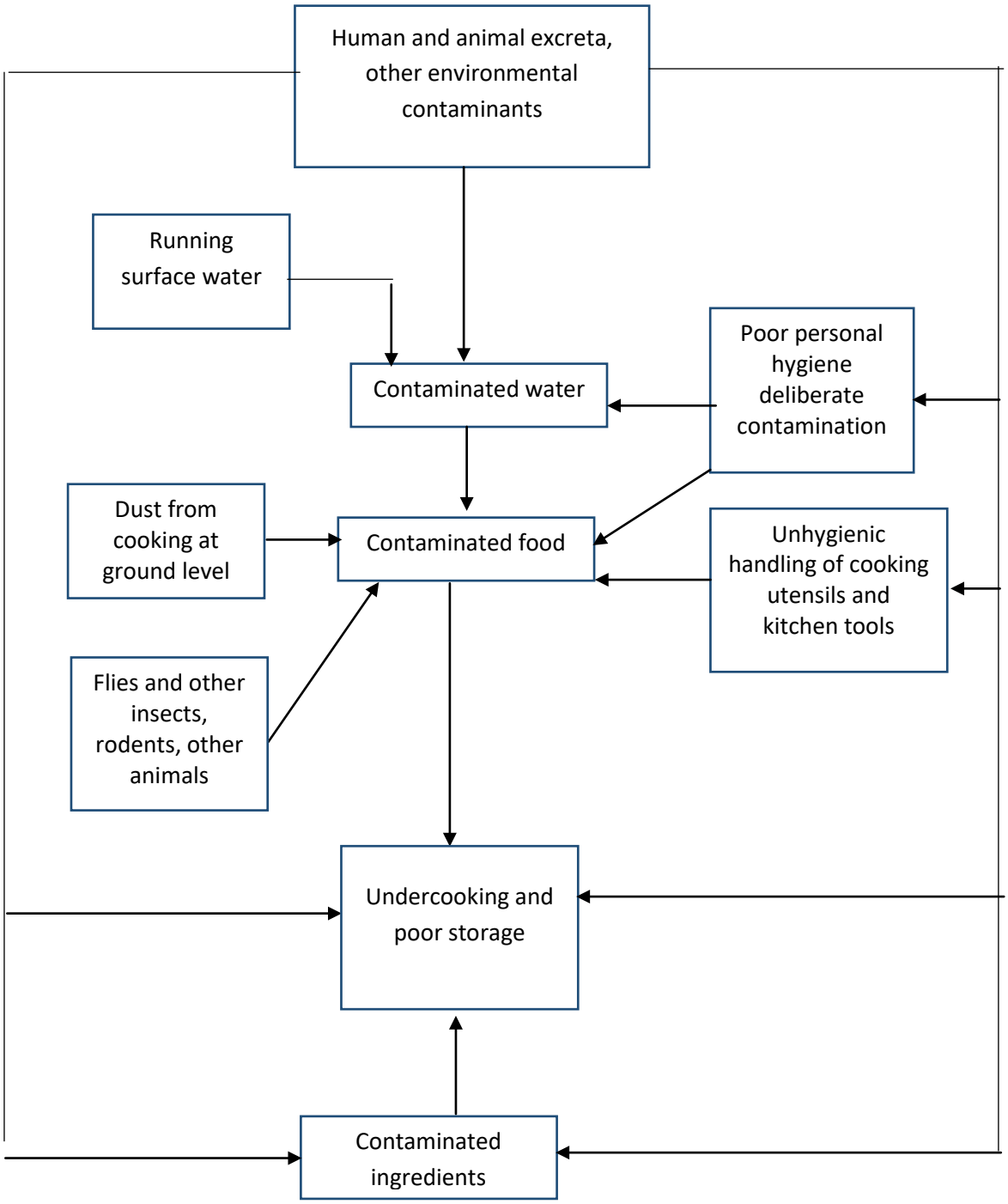
In summary, Gates (2011) gave the following food safety behaviour that can lead to food poisoning and consequently foodborne illnesses:

- Using the same utensils to serve contaminated food and other foods;
- Careless attention to personal hygiene while handling food e.g. not washing hands after visiting the toilet, touching nose while preparing food;
- Leaving skin infection and cuts uncovered while preparing food;
- Coughing, sneezing or spitting while preparing food
- Incomplete cleaning of food utensils and serving dishes,
- Pests like houseflies, cockroaches, beetles, certain moths;

- Rodents e.g. rats, mice;
- Household pets e.g. dogs, cats
- Infected or diseased cattle and dairy cows;
- Contaminated water supply;
- Soil and dust (Gates, 2011).
- In conclusion, human factor is at the centre of other factors (soil, air, etc.) responsible for food contamination leading to food-borne illness. However, through appropriate food safety behaviour one can gain control over the negative effects of all other factors responsible for food-borne illnesses.

Figure 2.1 is a graphical representation of the household food safety behaviour leading to food contamination.

Figure 2:1 Sources of Contaminants in Food



Source: Mensah *et al* (2012).

2.3 Concept of health

Health as a concept has been defined and interpreted in various ways. In 1948, the World Health Organization (WHO) defined health with a phrase that is still used till today. They defined health as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1948). In 1986, the WHO further clarified that health is a positive concept and a resource (social, personal and physical capabilities) for everyday life and not the object of living.

Another definition similar to WHO above given by www.healthknowledge.org.uk, sees health as a quality of life that includes an individual's physical, mental and social well-being. It is said to be a condition, state or quality of the whole individual that enables him carry on his daily activities that are both obligatory and non-obligatory. Another definition describes health as the ability of a biological system to acquire, convert, allocate distribute and utilize the energy with maximum efficiency. Similar to the above definitions but in a comprehensive way, was the definition given by Bergnes (2015), who described a healthy individual as a man who is well balanced bodily and mentally and well-adjusted to his physical and social environment. He is in full control of his physical and mental faculties, can adapt to environmental changes as long as they do not exceed normal limits and contributes to the welfare of society according to his ability. He further affirmed that health is not simply the absence of diseases, it is something positive, that is, a joyful attitude towards life and a cheerful acceptance of the responsibilities that life puts on the individual. Therefore to be healthy means holistic, soundness in body and mind (Bergnes, (2015).

In summary, there is a strong interrelationship among all of the dimensions of health. No one dimension of health works independently and each dimension will influence the others to determine the overall level of wellbeing and hence the health status of the individual. Therefore in order to maintain an optimal level of health there must be a balanced interactions among all the dimensions of health (i.e. physical, social and mental).

2.3.1 Dimension of health

According to WHO (2007), there are three dimensions of health viz: physical, social and mental health dimensions. She affirmed that the overall state of a person's health is dependent on the interaction among the three dimensions of health.

Physical health: This refers to the efficient functioning of the body and its systems. It is often the first dimension considered when examining an individual's level of health. It is the overall physical condition of an individual at a given time. It includes the reliability of their body function, freedom from diseases or illness. An individual with good physical health will be able to function well according to the way their body is expected to function. Healthy eating and appropriate level of physical activity are important for good physical health. The domains of health usually measured under physical health as given by Madans *et al* (2013), are:

Ability to do usual activities of daily living: such as bathing, dressing, eating, getting in and out of bed, walking, using the toilet.

Instrumental daily activities: such as using telephone, doing light house work/heavy house work, preparing meals, shopping for personal items, managing money, play, doing school work/job.

Vision: this covers a spectrum of seeing problem. This includes the dimensions of near or far vision, night blindness and monocular vision.

Hearing: hearing difficulty include a range of problems that deals with some specific aspects of hearing function, like the perception of loudness and pitch, discrimination of speech versions background noise and the localization of sounds.

Mobility: it is a physical function which is an important determinant in an individual's ability to live independently. Mobility domains is intended to capture movement difficulties associated with lower body functioning specifically walking and climbing with respect to both capacity without the use of personal assistance or assistive devices. The domain would capture difficulties in movement that are the result of health condition.

Cognition: this domain covers multiple dimensions of cognition including memory, concentration, learning, and decision making.

Affect: It captures the psychological and mood-related problems that impinge upon daily living. The respondent is placed along a severity continuum comprised of various dimensions of anxiety and depression.

Communication: This captures the difficulties in expression and receptive communication successful receptive language requires adequate hearing or seeing for sign language use, and the ability of an individual to process the phenology, grammar and semantics of the message (Madans *et al*., 2013).

Social health: This according to WHO (2007), is the ability of an individual to interact with others and participate in the community in both an independent and cooperative way, being accepted by others and interacting well within different groups of people, including family and peers are very important for good social health (WHO, 2007). Also social health may be described in terms of social adjustment and social support and the ability to perform normal roles in the society. The social dimension of health encourages an individual to contribute to their environment in order to increase the welfare of their community. Social health also emphasizes interdependence with others and being aware of each person's importance in the society as well as the impact they have on their community. A high level of social health leads to positive interactions and enjoyment with others.

Mental health: This refers to a state of wellbeing in which individual realizes his/her own abilities, can cope with the normal stresses of life, can work productively and is able to make contributions to his or her community. It also depends on the ability of a person to function where their thoughts, feelings and behavior are concerned not only relevant to themselves but to the world around them and having adequate coping mechanisms for dealing with stress (WHO, 2016). Additionally, a high level of mental health enables an individual to feel capable and competent to handle normal level of stress, maintain satisfying relationships and to be able to live an independent life. Another indication of good mental health is the ability of the individual to enjoy life, bounce back after difficult experiences, achieve balance, adapt to adversity, feel safe and secure and achieve one's potential (WHO 2016).

In conclusion, a person who experiences physical, social and mental health will be able to function well and live a full life.

2.3.2 Measurement of health status

Thomas and Frankenberg (2000), asserted that health status is hard to measure because it is multidimensional reflecting the combination of an array of factors that include physical, mental and social well-being, genotype and phenotype influences. What this portrays is that "true health status" is seldom known. WHO (2007), asserted that in order to measure health, indicators of health status needs to be made operational. These indicators of health status are considered to be either negative or positive measures. An example of negative measure is mortality while an example of positive measure is life expectancy. They however noted that this usual measurement of mortality and morbidity (which is the primary focus of most health measurement) are inadequate for assessing people who are not ill but have some limited function which affects their everyday life (WHO, 2007).

The current emphasis in public health is shifting to health promotion with more attention being given to positive indicators such as social and mental well-being. This is achieved by asking individual to give a self-report or assessment of their health status in the area of physical, social and mental functioning. Researchers in the area of health found that an examination of the relationships between self-report and physical assessment helps in determining the health status of people (WHO 2007, CPCP 2011). They stated further that self-reports which is based on general questions about one's health do contain a great deal of information about the respondents health status. To this end, researchers in the field of health had successfully developed ways to measure health status broadly to capture not only individual's physical health but also the quality of life and ability to function in the real world (WHO, 2016). It consists of a set of questionnaire that people can complete easily and quickly. The questionnaire incorporates several aspects of health in relation to the functional ability of the individual in the real world. This consists of three major components viz:

The physical functioning status which measures the ability to perform various physical activities such as walking, carrying groceries, climbing stairs, etc. Also

included is the role functioning which assesses the extent to which health interferes with daily activities like work or school.

Social functioning determines if health affects normal social activities, such as visiting friends or participating in group activities.

The third aspect is the mental health which measures areas such as depression or anxiety and being a happy person.

Towards this end, various instruments were developed to collect information about the health of people. It is a self-reported questionnaire, whereby people are to report/respond to set of questions depicting their health status. Among such instruments are:

The SHORT-FORM (SF- 36: It is an instrument which consists of 36 items grouped into 8 scales. It measures different domains of health which range from physical functioning (i.e. mobility and dexterity); role functioning (i.e. the impact of health on everyday role fulfilment); bodily pain; general health; vitality (i.e. energy/activity level); social functioning and mental health which measures the psychological or emotional distress/affect/anxiety domains.

Another instrument was the Lawton Instrumental Activities of Daily Living (IADL) Scale by Carla Graf (2013). This scale has 8 dimensions which are:

1. Ability to use telephone
2. Shopping
3. Food preparation
4. House keeping
5. Laundry
6. Mode of transportation
7. Responsibility for own medication
8. Ability to handle finances (Carla Graf, 2013).

Another instrument for measuring health was the one developed by the EuroQol Group EQ-5D. It is a generic measure of health status developed by an international research group called EuroQol group established in 1987. It is a standardized health related quality of life questionnaire used in order to provide simple generic measure

of health for clinical and economic appraisal. It comprises of five dimensions which are mobility, self-care, usual activities, pain/discomfort and anxiety/depression. Each dimension has three levels of measurement: no problem, some problems, and severe problems.

The above instruments are commonly used to measure health status. However, the argument against these instruments was that they do not capture all important domains of physiological and psychological functioning. In order to ameliorate the deficiencies of the aforementioned instruments, a more comprehensive instrument was developed by WHO (2007). It is called Long form (New Zealand Version) comprising of 62 items in 14 scales. The instrument was found to have excellent acceptability. The WHO Long form health status instrument is suitable for use when a comprehensive measure of self-reported health status is required in the context of individual and population health (WHO, 2007).

In conclusion, all the above instruments tried to capture the three dimensions of health (i.e. the physical, social and mental domains) in various degrees and the extent to which one functions in these areas of health depict his/her health status.

2.3.3 Self-perceived health status

Self-perceived health status as defined by Wu, Wang and Zhao (2013), is an individual subjective condensed summary of information about his/her bodily conditions. It provides a measure of the overall level of a population's health based on individual personal perceptions of their own health (Wu *et al*., 2013). It is a broader approach to measuring health which goes beyond quantifying levels of morbidity and mortality (Jung, Jong and Myung 2015). They stated further that this approach is to ask people to assess the state of their own health based on their awareness and expectations regarding their health. Self-assessed health status is influenced by various factors including access to health services and health information, the extent to which health conditions have been diagnosed and the level of education (Jung *et al*., 2015). Other factors added by WHO (2016), are environment, genetics, income, educational level and relationships with friends and family.

In conclusion, health is a resource for everyday living and can be influenced by the above factors either positively or negatively depending on how one manages them.

2.3.4 Determinants of Health

According to the Advisory Committee on Health and Disability in New Zealand (2008), the determinants of health are the main factors that protect and promote good health. They stated that the social and economic factors that have greatest influence on health are income and poverty, employment and occupation, education, housing culture and ethnicity. They concluded that social, cultural and economic factors are the most important determinants of good health.

In the same vein, the WHO (2003), suggested that social determinants of health included social gradients, stress, early childhood development, social exclusion, unemployment, social support networks, addition, availability of healthy food and availability of healthy transportation.

In addition to the above the "Social Determinants of Health" (SDOH, 2008) added job security, food insecurity, health services, aboriginal status, gender and disability as social factors that clearly related to health outcomes and are closely tied to public policy.

Similarly, the United Nations Centre for Disease Control (CDC, 2013) defines social determinants of health as life-enhancing resources such as food supply, housing economics and social relationships, transportation, education and health care, whose distribution across populations effectively determines length and quality of life. They maintained that these social determinants of health influence health promoting behaviours and that health equitable distribution of social determinants among groups.

In a study done by Marmot and Bello (2009), on health disparities in wealthy countries found that income and mortality rates are correlated as a marker of relative position within society, and that their relative position is related to social conditions that are important for health. These social conditions include good early childhood

development, access to good quality education, rewarding work, decent housing and a clean and safe environment.

WHO (2011), Commission on Social Determinant of Health realized that health care is essential for equitable health and therefore, said that health care should be a common good rather than a market commodity. However, there is substantial variation in health care systems and coverage from country to country. She explained further that distribution of social determinants are shaped by public policies that

reflect the influences of prevailing political ideologies of those governing a jurisdiction.

This unequal distribution of health damaging experiences is not in any sense a natural phenomenon but is the result of a toxic combination of poor social policies, unfair economic arrangements and bad politics.

On health determinants at individual level, Fasina (2007), recognized three major factors that affect health of individual which are heredity, environment and behavior, and that a person is a product of interaction of these factors and the outcome is generally dependent on the degree of strength of each of these factors that enters into the interaction process. He defines heredity as the biological traits passed down from parents to their offspring. It is considered as the factor that generally provides the foundation required for a person's future health as well as other personal attributes. Environment on the other hand, consists of physical, biological and psychosocial elements. The influence of environment on health is as great as that of heredity. Environment confers positively or negatively on the heredity traits of an individual. The physical components, are natural: air, rain, climate, soil etc man made: food, shelter, clothing etc. Biological components are micro-organisms, plants, and animals. The psychosocial components: stress, cultural values, attitudes, economic status and educational status.

Human behaviour which is the third factor is also critical in determining the health of an average individual. Through human behavior one can offset to a considerable extent, his heredity defects and overcome or at least make necessary adjustments that may reduce the limitations or effects of the inherited conditions. Man can through his behavior effect changes or adapt himself to his environment that will increase his opportunities for living safely and healthy lives. He therefore, concludes that what a man does or fails to do have a far reaching impact on his health even more than either his biological inheritance or the nature of his environment.

In the above figure, demographic changes affect population health. The committee maintained that an increase in one-parent families an ageing population and people

starting family later in life will influence both the nature of social and economic environment and the health status of the population.

Individual lifestyle factors such as diet, smoking and alcohol, physical activity and sexual behaviour are also important for determining health status of people. Affordable and appropriate health and disability support services are also important as well as improvements in health services.

Health is also affected by social and community influences, living and working conditions, broad social-economic factors, cultural and environmental conditions. A clean and safe environment , adequate income, meaningful roles in society, good housing, population based services and utilities, affordable nutrition's food, educational and social support within communities all contributes towards good health.

In conclusion, one of the deductions from this review is that the more an individual gains control over these factors that protects and promotes health the better the person's health.

2.3.5 Health status and health care delivery in Nigeria

Healthy People (2020), affirmed that access to health care services and the quality of health services can impact health. Lack or limited access to health services greatly impacts health and individual health status (Healthy People 2020).

There are several definitions of health care as given by researchers in this area. According to Eme *et al*. (2014), health care is the provision of suitable environment which is aimed at the promotion of development of man's full potential. However, WHO (2015), gave a comprehensive definition of health care as the prevention, treatment and management of illness and the preservation of health through the services offered by health care organizations and professionals. It includes all the goods and services designed to promote health, including preventive, curative and palliative interventions whether directed to individuals or to population (WHO, 2015). Report by NBS, (2014) shows that the health care system in Nigeria is in deplorable state. Considerable efforts made by government over the years met with little success. There are three basic health care services which are run by the three

tiers of government in Nigeria. Also the country operated dual system of health care delivery which are: orthodox and the traditional (Ebi Eko, 2017). However, Ebi Eko noted that, the economic recession in the country has affected various sectors of the economy including the health sector leading to low productivity, poor service delivery and poor health outcomes. The National Health Insurance Scheme (NHIS) which was created in 1999 is not effective due to narrow coverage, weak education and enlightenment schemes, poverty and illiteracy (CIA, 2014, NBS, 2014). In addition to the above, Nigeria health system is also affected by lack of well-trained health care specialists as a result of brain drain of qualified medical and public health specialists (NBS, 2014). Furthermore, NBS (2010), reveals that Nigeria has only 61,000 qualified medical personnel that is expected to care for 140 million Nigerians at a poor ratio of 1:2,295 persons.

Health funding in Nigeria is relatively low at less than 5% of GDP therefore, funding of health relies on a mixture of government budget, external funding and private out of pocket spending (NBS, 2010, CIA, 2012). The Nigeria Demographic and Health Survey conducted by National Population Commission (NPC) and ICF International (2013), found that only 43.5% of Nigeria people have access to health care. They attributed this inadequacy to the peculiar demographics of the Nigeria populace thus:

1. About 55% of the population lives in rural area while 45% live in urban areas.
2. About 70% of the health care is provided by private vendors and only 30% by the government.
3. Over 70% of drugs dispensed are substandard, hence the ineffectiveness of NHIS.
4. NHIS only represents 40% of the entire population with 52-60% employed in the informal sector.

Over half of the population live below poverty line of less than one dollar a day therefore could not afford the high cost of health care. They concluded that Nigeria health system is poorly developed and has suffered backdrops especially at the Local government levels (NPC/ICF 2013).

The above barriers to health services usually lead to unmet health needs, delay in receiving appropriate care, inability to get preventive services and hospitalization that could have been prevented.

CHAPTER THREE

THEORETICAL BACKGROUND AND CONCEPTUAL FRAMEWORK

3.1 Theoretical framework

Theoretical framework is the explanation of a particular phenomenon using relevant theories or models. Theories/models help predict and highlight the pattern of relationship that exists between variables or concepts in a study (Bakar, 2009). Based on the review of literature, the following theories and model have been considered relevant to this study. They are:

1. Health Belief Model (HBM)
2. Theory of Planned Behaviour (TPB)
3. The Social Cognitive Theory (SCT)

These are used to explain how humans acquire and maintain certain behaviours. According to Bandura (1977), as cited by Chery (2011) most human behaviour is learned observationally through modelling, and the mental states of the individual along with the physical and social environment interact to produce an observed behaviour.

3.1.1. Health Belief Model (HBM)

This model is one of the first theories of health behaviour and remains one of the most widely recognised in the field. It was developed in 1950s by a group of United State Public Health Service Social Psychologists who wanted to explain why so few people participate in programmes meant to prevent and detect disease. The HBM is a cognitive model which posits that behaviour is determined by a number of beliefs about threats to an individual's well-being and the effectiveness and outcomes of particular actions or behaviour. Perceived threat is at the core of HBM as it is linked to person's readiness to take action. It consists of two sets of beliefs about an individual's susceptibility to a particular threat and the consequences that may result from it. The perceived benefits associated with a behaviour, that is, its likely effectiveness in reducing the threat are weighed against the perceived costs of and negative consequences that may result from it (perceived barriers). The individual's perceived capacity to adopt the behaviour (their

self-efficacy) is a further component of the model. With this model, six main constructs is believed to influence people's decisions about whether they will take action to prevent or control illness. The six main constructs are perceived susceptibility, perceived seriousness, perceived benefits, perceived barriers, cues to action and self–efficacy.

This model is of relevance to this study, in that, it helps to predict the food safety behaviour of rural households based on the six constructs of the model. The rural households' perception of their susceptibility to food borne illness and its severity which is a threat to their health is likely to produce health promoting behaviour. For example their experience of nausea, vomiting, diarrhoea, headaches (which are symptoms of foodborne illness) and its severity probably death. If rural households believe that engagement in food safety behaviours will reduce their susceptibility to food borne illness and its severity, then they are likely to engage in food safety behaviours. However, certain health related behaviours are also a function of perceived barriers to taking action. The perceived barriers in this case are lack of finance, lack of infrastructure, perceived inconvenience, cumbersome nature of food safety practices, social norms among others. If these outweighs the perceived benefits of taking action they may not engage in food safety behaviours. Therefore perceived benefits of engaging in food safety behaviour should outweigh the perceived barriers. Also individual characteristics of the food handlers in the household including demographic, psychosocial and structural variables can affect the perceptions (i.e. perceived severity, susceptibility, benefit and barriers) of health related behaviour. Demographic variables like sex, age, education among others, psychosocial variables include personality, social class, group pressure among others, structural variables include knowledge about a given food borne disease and prior contact with the disease among other factors. These are modifying variables that can affect the food safety behaviours of rural households in this study.

The cue to action in this model refers to "trigger to action" which may be internal or external. In the case of rural households, experience of symptoms of foodborne illness are examples of internal cues to taking action. External cues includes events or information from media, friends, neighbours, health practitioners which promotes engagement in health related behaviours. The last construct of the model is self-efficacy which refers to the efficiency or competence of rural households to successfully perform

the expected food safety behaviour. Graphical representation of the model is shown in Figure 3.1

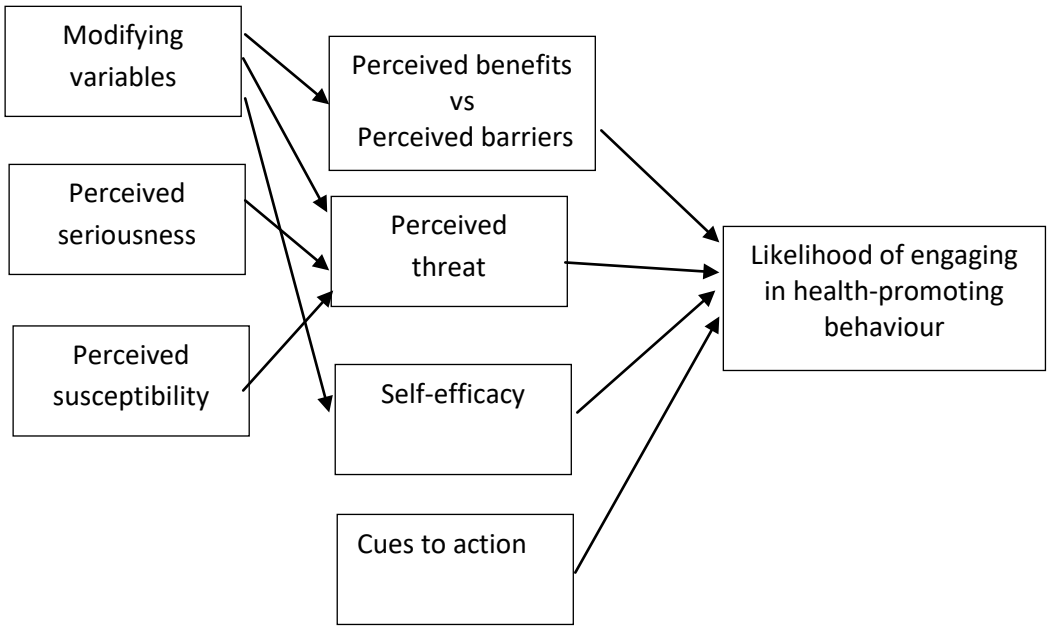


Figure 3.1 The Health Belief Model

Source: Wikipedia https://en.wikipedia.org/wiki/health_belief_mode

3.1.2 Theory of Planned Behaviour(TPB)

This theory is one of the most widely cited and applied behaviour theories. It is one of a closely inter-related family of theories which adopt a cognitive approach to explaining behaviour which centres on individual attitudes, beliefs and subjective norms. It examines the relations between an individual beliefs, attitudes, intentions, behaviour and perceived control over that behaviour (Ajzen, 1991). The TPB evolved from the theory of reasoned action (TRA) which posits intention as the best predictor of behaviours (Fishbein and Ajzen, 1975). The TPB posits that the most important determinants of behaviour is intention which in-turn is predicted by attitudes, subjective norms and perceived behavioural control. These are referred to as motivational factors which work together to influence one's behavioural intentions.

Attitude towards the behaviour is a personal and predisposed factor referring to a favourable or unfavourable stance that a person takes in the light of the evaluation of the target behaviour (Kwan, 2009). The more favourable attitudes contribute to the greater strength of intention and vice versa. *Subjective norm* is a social factor and it refers to the pressure one perceives about whether or not to perform the behaviour as established by his or her belonging to social group. The subjective norm that is in-favour of the behaviour contributes to the strength of behavioural intention. *Perceived behavioural control* refers to one's perceived available opportunities and resources required to perform the behaviour contributing to perceived ease or difficulty in its performance (Chain, 2000). Perceived behavioural control is contextually and behaviourally specific and may vary across situations. It provides individuals with confidence that they are able to perform the behaviour. The greater perception of control should result in a stronger intention to behavioural achievement.

The TPB can be used to predict the food safety behaviour of rural households in this study which is determined by their intentions to act and these intentions are a function of attitudes, subjective norms and perceived behavioural control. Thus, their intention to engage in food safety behaviour to promote their health is hinged on having favourable attitude to food safety practices, support from social group, friends, husband etc and the presence of resources needed to perform the action.

3.1.3 Social Cognitive Theory (SCT)

Social Cognitive Theory proposed by Bandura (1986) cited by Chery (2011), states that people are driven not by inner forces alone but by external factors. It explains human behaviour in terms of a three way dynamic reciprocal model in which personal factors, environmental influences and behaviour continually interact. This is often known as reciprocal determinism. Environmental factors represent situational influences, and environment in which behaviour is performed, while personal factors include instincts, drives, traits and other individual motivational forces.

SCT highlights the idea that much of human behaviour occur in a social environment. By observing others, people acquire knowledge of rules, skills, strategies, beliefs and attitude. Self-efficacy is another construct in this theory. Self-efficacy is the confidence one has in his/her ability to perform a given behaviour despite obstacles or challenges.

The SCT is relevant to this study in that the food safety behaviour of rural households do not just occur but by the interactions of the knowledge, skills, beliefs and attitude which they acquire from their social environment and their personal characteristics like sex, age, education, income, family size etc. Their self-efficacy can also be predicated on the belief that they can change their health risk behaviour and to persevere in the face of challenges or constraints to food safety behaviour in order to prevent food-borne illness in their households.

3.2 Conceptual Framework

The conceptual framework attempts to define the orientation underlying this study. According to Miles and Huberman (1994) conceptual framework is defined as a written or visual representation that explains the main factors to be studied either in graphical or narrative form. It considers the key factors, concepts or variables and the presumed relationship among them. The conceptual framework in fig.3.3 has been designed to show the independent, intervening and dependent variables. The principal concept upon which this study is based is contribution of food safety behaviour to health status of rural households.

3.2.1. Independent variables

The Independent variables of the study include the socio-economic characteristics of rural households (sex, age, educational level, occupation, marital status, household size, monthly income, membership of association), sources of information on food safety practices (radio, friends and family, health agencies, neighbours, television, newspaper), knowledge, attitude and food safety practices (KAP) of rural households. This was based on four safer keys to food safety practices developed by WHO, (2007) namely: food purchase and storage, personal hygiene, food preparation and cooking time, cross contamination. The independent variables also include constraints to food safety practices (inadequate finance, lack of infrastructure, cumbersome nature of food safety practices, social norms, cultural practices), health care services used by rural households (government hospital, private clinic, traditional/herbalist, patent medicine store, self-medication), food-borne illnesses experienced by rural households in the last one year and the frequency of occurrence of such foodborne illnesses.

3.2.2. Intervening variables

Intervening variables are the underlying variables stemming from the situation under which the framework is being operationalized. These include government policy, heredity, environment, taboo, belief and practices.

3.2.3. Dependent variable

The dependent variable is the health status of rural households. This will be measured using three health domains namely: physical functioning, social functioning and mental functioning. The health status of rural households will be classified as either good or poor.

3.2.4 How the conceptual framework works

The conceptual framework for this study is shown in Figure 3.3. It is a schematic representation presenting the various variables being investigated in the study. It shows the inter-relationship among these variables and the eventual outcome being envisaged. The framework therefore provides a vivid explanation of rural households' health status (dependent variable) which is directly influenced or affected by the independent

variables. The independent variables range from socio-economic characteristics, sources of information on food safety, knowledge of food safety, attitudes to food safety, food safety practices, health care used, food-borne illness experienced, frequency of food-borne illnesses experienced and constraints to food safety practices. The framework also shows how intervening variables such as government policy, heredity, environmental factors, food taboo, ignorance, belief and practices indirectly affect both the dependent and independent variables. The relationship is discussed as follows:

Socioeconomic characteristics of rural households will affect their food safety behaviour (knowledge, attitude and practices) which is expected to lower or reduce the risk of food borne diseases outbreak in their households. Socio-economic characteristics of rural households will also affect their choice of sources of information on food safety. Their educational attainment, membership of association, income level etc. will facilitate their resolve to seek for accurate and correct information on food safety. Knowledge on food safety acquired by rural households will also serve as catalyst for developing favourable attitude to food safety practices. However the food safety behaviour of rural households is not only dependent on their knowledge level or attitudes to food safety alone but also on their socio-economic characteristics (like age, household size etc.). In the framework is the constraints to food safety practices being experienced by rural household. For example households with high knowledge of food safety and favourable attitudes to food safety may be prevented from practicing personal hygiene of hand washing during food preparation due to lack of portable water for drinking and cooking. Also cooking of food thoroughly in order to destroy the pathogens in the food may not be observed for lack of resources (kerosene or fuel wood). The observed relationship between the frequencies of food-borne diseases experienced by rural households can affect their health status.

The intervening variables (government policy, heredity, environmental factors, etc.) will indirectly affect the health status of rural households but will not be studied. For example a healthy individual who live permanently in a disease endemic environment may never enjoy good health, whereas an apparently unhealthy person that has access to quality medical care in the right environment may still enjoy a fulfilled life. Therefore, health status of rural households can be indirectly affected by these factors.

In conclusion, all the independent variables (socio economic characteristics, sources of information on food safety, knowledge on food safety practices, constraints to food safety practices, food-borne disease experienced, frequency of food-borne disease experienced, health care use) and the intervening variables (government policy, heredity, environmental factors, food taboo, ignorance, allergies, belief and practices) will interact together to determine the health status of rural households in the study area.

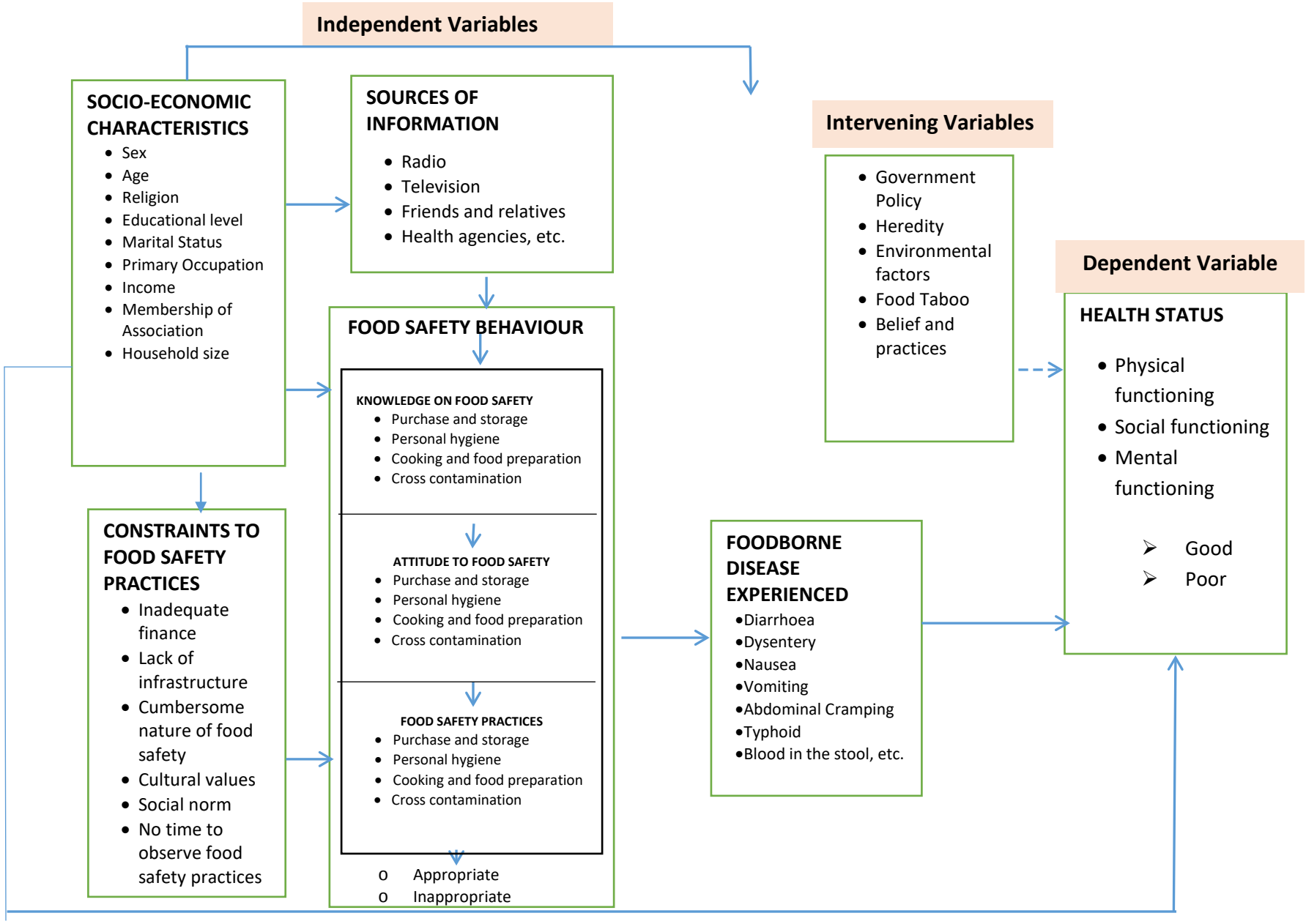


Figure 3.2: Conceptual Framework on the Contribution of Food Safety Behaviour to Health Status of Rural Households

CHAPTER FOUR

METHODOLOGY

This chapter presents the study area, study population, sample procedure and sample size, instruments for data collection, validation of instruments, measurement of variables and data analysis.

4. 0. Area of study

The study was conducted in Southwestern part of Nigeria. Southwestern Nigeria is one of the six geopolitical zones (i.e. Southwest, Southeast, South-south, North central, Northeast and Northwest) in Nigeria. It lies between latitude 5º8' and 9º10' and has an area of 76, 283 sq.km representing 12% of the country's total land area. There are six states (Ekiti, Lagos, Ogun, Ondo, Osun and Oyo) within this zone and are mainly Yoruba speaking states with various dialects. These states have both rural and urban areas. The 2006 census figure put the population of the zone at 27,581,993 people (Federal Republic of Nigeria Official Gazette, 2007).Southwestern Nigeria is predominantly an agrarian area with rainforest and derived savannah vegetation. Agriculture is the main source of livelihood for most rural people in this zone. Crops cultivated in this zone consists of both arable and cash crops like maize, cassava, yam, vegetables, pepper, cocoa, kolanut, oil palm, plantain and banana, shear- butter, locust bean, cashew and mango plants. The zone is also suitable for the growth of millet, sorghum and cowpea.

In Nigeria generally, women's responsibility is to purchase and prepare food for the family. The people of the Southwest predominantly Yorubas are believed to be the most diverse eaters in Nigeria. The traditional meals are often based on starchy foods/staple usually made from maize/corn, yam, cassava, plantains. These are dried and ground into flour/ a thick paste/ dough. The starchy staple food are often served with soup/stew with onions, tomatoes and okra to flavor these stews. The Southwestern people prepare from their yam based cuisine *iyan* (pounded yam), *amala* to their bean based delicacies like *akara*, *moinmoin* and their love for *ponmo and efo riro*. Precisely, Ekiti people love pounded yam and *egusi*, Oyo State love *amala/ lafun* with *ewedu* and *gbegiri (abula*),

while Ogun State (Abeokuta) love white *amala* and *ewedu*, Ijebu ode love *ikokore* and *garri Ijebu* (http://allnigerian food.com/Nigerian-food-culture).

There is no law in Nigeria that enforces food culture or customs, however, there are Nigeria food culture/customs set by families to ensure and cultivate proper cooking and eating habits in order to safeguard the health of households. Some of these food culture are: you must wash hands before eating, women must cover their head before cooking, avoid talking while eating. These food customs blended well with food safety practices.

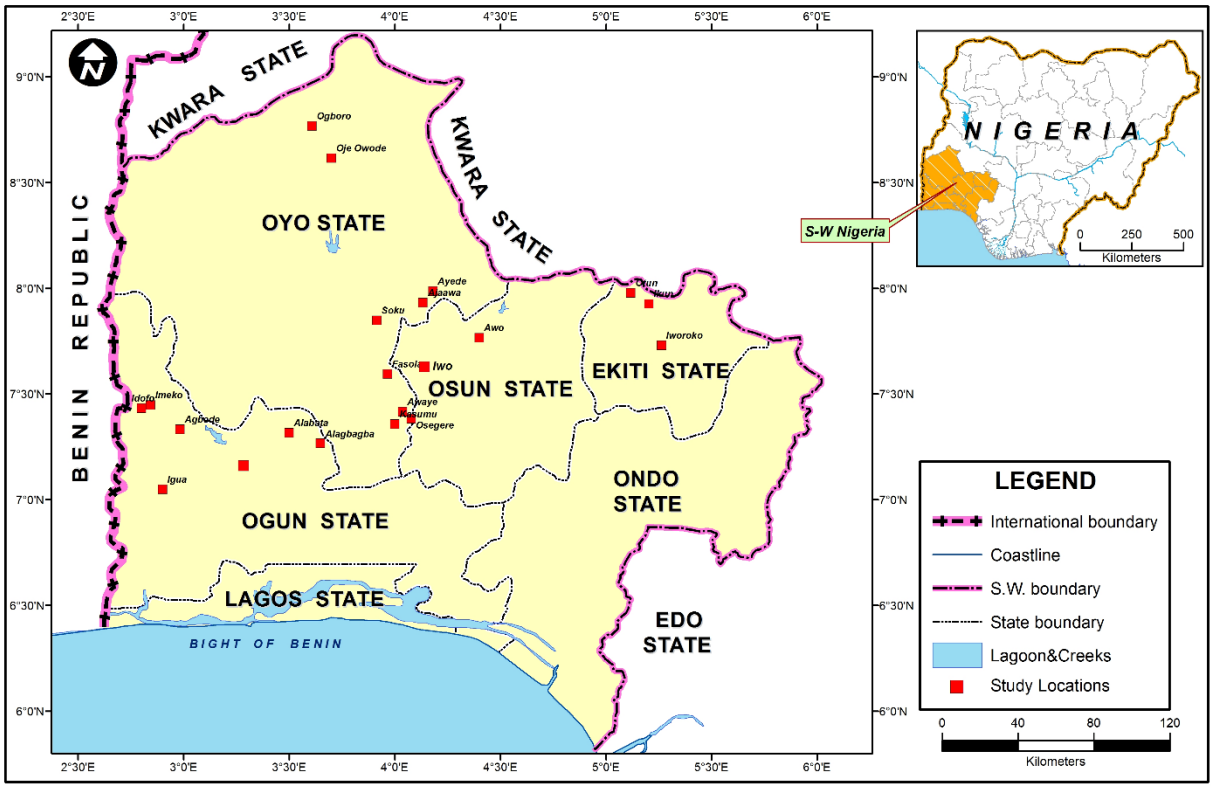


Figure 4.1 Map of Southwestern Nigeria showing the study location

4.1. Population of the study

The target population for this study was the food handler in rural households in the study area.

4.2. Sampling procedure and sample size

Multi-stage sampling procedure was adopted in selecting respondents for this study. Southwestern Nigeria consists of six States namely: Ekiti, Lagos, Ogun, Ondo, Osun and Oyo.

Stage 1: The first stage involved random sampling of 50% out of the six States in the Southwestern Nigeria. The states sampled were Oyo, Ogun and Ekiti states.

Stage 2: The second stage involved purposive sampling of 20% of rural Local Government Areas (LGAs) from the selected States in stage one. Oyo State has 33LGAs out of which 21 are rural, Ogun State has 20 LGAs out of which 16 are rural, while Ekiti State has 16 LGAs out of which 12 are rural (National Population Commission, 2006). In Oyo state, 4 rural LGAs were randomly selected, Ogun State, 3 rural LGAs were randomly selected while in Ekiti State 2 rural LGAs were randomly selected.

Stage 3: In the third stage, 20% of the politically created wards were randomly selected from the rural LGAs in stage two, this gave rise to 8, 6 and 4 wards for Oyo, Ogun and Ekiti States respectively.

Stage 4: In the fourth and final stage, 5% of households were randomly sampled in proportion to the size of the wards as shown on Table 4.1. This produced 120, 90 and 60 rural households from Oyo, Ogun and Ekiti states respectively. In all a total of 270 rural households were sampled for this study. The sampling procedure is illustrated in Table 4.1

Table 4.1 Composition of sample size

Selected State (50%)	Rural LGA (20%)	Ward sampled (20%)	Number of household sampled (5%)	Total number of respondents
Oyo	Oyo West	Fasola	13	120
		Soku	12	
	OgoOluwa	Ajaawa1	16	
		Ayede	13	
	Egbeda	Osegerel/Awaye	17	
		Kasumu	17	
	Saki East	Ogboro	12	
		Oje Owode	10	
Ogun	Egbado North	Idofo	15	90
		Igua	13	
	Odeda	Alabata	14	
		Alagbagba	18	
	Imeko-Afon	Imeko	18	
		Agbede	12	
Ekiti	Irepodun/Ifelodun	Awo	14	60
		Iworoko	12	
	Moba	Otun1	19	
		Ikun1	15	
Grand total				270

4.3. Instruments for data collection

The study used both quantitative and qualitative methods for data collection. Quantitative data was obtained through the use of structured questionnaire. The qualitative method used was Focus Group Discussion (FGD) for rural households' food handlers. In all a total of six FGDs were carried out in the selected states. Each focus group consists of about 8-10 participants. In all 53 participants participated in the FGDs.

4.4. Pre-testing of instrument

The instrument developed for data collection was pre-tested in Osun state which was not among the sample states for this study. This served as the bases for removing ambiguous items and reframing of others where necessary.

4.5. Validation of instrument

The instrument for data collection was validated using content and face validity with the help of experts in agricultural extension, rural sociology and public health.

4.6. Test for reliability of instrument: The reliability of the instrument was tested using the split-half method. A reliability coefficient of 0.70 was obtained.

4.7. Measurement of variables

Independent variables

Section A: Socio-economic characteristics

1. **Age**: Respondents were asked to state their actual age in years
2. **Sex**: Respondents were asked to indicate their sex from the options of male and female: score of 1 was assigned to male respondents while 0 was assigned to female respondents.
3. **Marital Status**: Respondents were asked to indicate the option that describes their marital status from single, married, divorced**,** widowed and these were assigned the nominal values of 1, 2, 3 and 4 respectively.
4. **Educational attainment:** Respondents were asked to indicate their level of educational attainment from a list of responses namely: no formal education,

primary school, secondary education, tertiary education with nominal values of 0, 1, 2, and 3 assigned respectively.

5. **Years of formal education:** Respondents were asked to state the number of years they used in acquiring formal education. This was measured at interval level.
6. **Marriage duration:** Respondents were asked to state the number of years they have been married. This was measured at interval level.
7. **Religion**: Respondents were asked to indicate their religion from the options of Christianity, Islam, Traditional and Others with nominal values of 1, 2, 3 and 4 assigned respectively.
8. **Primary occupation**: Respondents were asked to state their main occupation.
9. **Secondary occupations**: Respondents were asked to state other occupations apart from their main occupation.
10. **Household size**: Respondents were asked to state the actual number of people living with them. This was measured at interval level.
11. **Membership of association**: Respondents were asked to state the association they belong to from the options of social organization, religious organization, cultural organization and political organization. Nominal scores of 1, 2, 3, and 4 were assigned respectively.
12. **Monthly income**: Respondents were asked to state their monthly income in Naira from their primary and secondary occupation**.** This was measured at interval level.

Section B: Sources of information on food safety practices:

Respondents were asked to indicate how frequent they receive information on food safety practices from the list of identified sources of information adapted from Babalola, Babalola and Bassey (2010). The list of the sources of information are: friends and family, neighbours, radio, television, health agencies, newspaper, religious body, phone and social media. This was operationalized as always, occasionally and not used with scores of 2, 1, and 0 assigned respectively. Weighted mean was computed and used to rank the sources of information in order of frequency of use.

Section C: Food safety behaviour

Respondents" food safety behaviour was computed on the basis of their knowledge on food safety, attitude to food safety and their food safety practices (KAP). The sum of the standardized (z) scores on knowledge, attitude and practices was used to obtain a mean score of $\bar{x} = 6.5 \pm 2.21$. Scores above the mean represent appropriate behaviour while scores below the mean represent inappropriate behaviour.

Section C1: Knowledge on food safety practices: Respondents' knowledge on food safety practices was inquired using the four safer keys to food safety as stated by Centre for Disease Control on food safety Winnable Battle (CDC, 2014). The four keys are: Purchase and storage, Cooking and food preparation, Personal hygiene and Cross contamination. A total of 21 knowledge items were presented to the respondents. Each statement has three options (a, b and c) from which the respondent choose from. Correct response attracts a score of 1 while incorrect response attracts a score of 0. A maximum score of 21 and a minimum score of 0 was expected. Mean score of 13.9 was obtained. This was used to categorise the respondents into either high or low level of knowledge on food safety.

Section C2: Attitude to food safety practices

Respondents' attitude to food safety practices was elicited by presenting 17 attitudinal statements to the respondents and they were asked to respond to the statements using a 5-point Likert scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (SD). Scores of 5, 4, 3, 2 and 1 was assigned to positively worded statements and 1, 2, 3, 4 and 5 assigned to negatively worded statements. Maximum scores of 85 and minimum score of 17 is expected. A mean score of 47.1 was obtained. This was used to categorise the respondents as having favourable or unfavourable attitude to food safety.

Section C3: Food safety practices

Food safety practice was operationalised based on the four key principles of food safety as developed by CDC (2014). The four key principles are: food purchase and storage, personal hygiene, cooking and food preparation and cross-contamination. A total of 20 statements on food safety practices adapted from CDC (2014), were presented to the respondents. Response to these statements was operationalized as always, occasionally and never, with scores of 2, 1 and 0 assigned respectively. A maximum score of 40 and

a minimum score of zero (0) were obtainable. A mean score of 31.9 was obtained and used in categorising respondents as having high or low level of food safety practices.

Section D: Constraints to food safety practices by rural households

A list of five constraints was presented to the respondents from which they indicated how these constraints hinder them from observing food safety practices. This was scaled as: not a constraint, mild constraint and severe constraint, with scores of 0, 1 and 2 assigned respectively. Mean score of 5.1 was obtained and used to rank the constraints in order of severity.

Section E: Food-borne illnesses experienced

Respondents were presented with a list of 15 food-borne illnesses adopted from WHO (2007), and were asked to indicate if they experienced these illnesses or not. Two response options were presented: experienced and not experienced; scores of 1 and 0 were assigned respectively. Obtainable maximum score was 15 and minimum 0. Mean scores generated for each of the food-borne illnesses were used to rank them in order with which they were experienced by the respondents.

Section F: Frequency of food borne illness experienced

Respondents were presented with a total number of 15 food-borne illnesses adopted from World Health Organization WHO (2007). They were asked to state how often members of their households experience food-borne illness in the last six months. The response options are: weekly, fortnightly, monthly, once in three months, once in six months and not at all. Scores of 5, 4, 3, 2, 1 and 0 were assigned respectively. Mean scores generated for each of the food-borne illnesses were used to rank them with respect to the frequency of occurrence.

Dependent variable

The dependent variable of the study is the health status of rural households in southwestern Nigeria. The health status of rural household was measured by adapting the World Health Organization- Long Form (New Zealand Version) Health Survey Questionnaire (WHO, 2007). Respondents were asked to respond to questions under three health domains (physical functioning, social functioning and mental functioning).

Respondents physical functioning was ascertained by asking the respondents to rate how difficult they find carrying out some activities that depict their health status. Some of the activities were: activities of daily living, mobility and dexterity, vision, hearing, sleep etc. The response options were: usually do with no difficulty, do with some difficulty, do with much difficulty and usually do not do because of my health; and scores of 3, 2, 1 and 0 were assigned respectively.

Respondents social and mental functioning was ascertained by asking the respondent to rate how often they carry out social and mental activities with response options of: all the time, most times, sometimes and not at all, with scores of 3, 2, 1 and 0 assigned respectively. For the three health domains, respondents would respond to a list of 46 statements. Mean score of 9.0 was obtained and used to categorize the respondents as having either good or poor health status.

Data analysis

Descriptive and inferential statistics were used to analyze the data. Descriptive statistics include frequency, percentages, mean and standard deviation while inferential statistics include Chi square, Pearson Product Moment Correlation, Multiple linear regression at $p = 0.05$ and ANOVA.

Testing of hypotheses

H_{01}: This was tested using Chi square and PPMC

H_{02} - H_{05}: These were tested using PPMC

H_{06} and Ho_7: These were tested using Multiple Linear Regression.

Ho_8: This was tested using PPMC

Ho_9 and Ho_{10} were tested using ANOVA

CHAPTER FIVE

5.0 RESULTS AND DISCUSSION

This chapter presents the results and discussion of the analysed data. The results are in line with the various specific objectives and hypotheses of the study.

5.1 Socio-economic characteristics of respondents

Age

The age distribution of the respondents as shown in Table 5.1 reveals that the mean age of respondents was 43±11.9. This shows that there is a predominance of matured food handlers in the rural households. Hence, respondents are expected to have better understanding and knowledge of food safety practices. Several studies have attested to the importance of age in determining the public understanding of food safety practices and that matured older people were more concerned about food safety practices and hazards than young people (Borrusso, Henley & Quinlan 2015, Ali, 2015, Abiabio 2014, Gould *et al.,* 2013). Similarly, Hudson and Hartwell (2012), indicated that older people cook more safely than younger people. With the age of these respondents, sufficient and substantial information on food safety practices were promoted. This result is similar to that of Sonika and Jasvinder (2015), who found that home food handlers of 45 years and above had the highest food safety practices more than young people.

Sex

Table 5.1 reveals that majority (75.6%) of the respondents were females while 24.4% were males. This shows that women are still primarily responsible for cooking/food preparation in the home. Traditionally in Nigeria and other African societies women are the custodian of food preparation in the home. This findings is in agreement with Burruso, Henley and Quinlan (2015) who reported that 86% of the home food handlers are women. Similar studies (Gould *et al.* (2013), Rodriguez *et al,* (2010) and Scott *et al.*(2009) have reported higher proportion of females' involvement in food handling and preparation in the households. Moreover, the sex of the home food handlers is likely to influence their adherence to food safety practices. Women are likely to possess higher level of food safety

skills more than men. This corroborates the study of Solala and Sasimalani (2016), who found that female food handlers performed higher in food safety practices than their male counterparts.

Marital status

Table 5.1 also shows that majority (82.2%) of the respondents were married. In the traditional African society high value is attached to marriage relationships especially when individuals are matured. Married mothers are more likely to take to food safety practices in the preparation of the family meals, thus guaranteeing the safety of their children and spouses meals. Moreover, married people especially women are likely to possess higher level of food safety skills needed to prepare safe and healthy food for their household members. This view is in tandem with the assertion of Vitalis *et al.* (2016) that married women are more careful to observe food safety practices more than unmarried women. This result is similar to the findings of Losasso *et al*. (2015), who found that 80% of rural household food handlers are married.

Marriage duration

Results in Table 5.1 shows that a good proportion (48.5%) of the respondents had marriage duration of less or equal to thirteen years, while 28.2% and 15.9% had been married for between 14 and 26, 27 and 39 years respectively. With their mean duration (16.51) of marriage it is noted that the respondents are not young in marriage. They have had ample time with their families, which would have afforded them the opportunity to handle family feeding safely. Suffice to say that their experiences over the years as family food handlers would contribute positively to preparing safe food for their families by taking pains to observe food safety practices. This is in line with the findings of *Fasoro et al.* (2016), who reported that those who were married for a period of ten years or more adhere to food safety practices than young married ones due to the level of skill gained in safe food preparation over the years.

Educational attainment

Table 5.1 reveals that 35.6% had tertiary education, while 20.4% and 18.5% had secondary education and primary education respectively, and 25.6% had no formal education. This distribution reflects that the respondents are mostly literates. Unlike various studies done in developing countries this study had a significant number of home food handlers with secondary school and tertiary education levels. This suggests that the respondents are likely to appreciate food safety as well as have food safety behavior positively transformed as a result of their educational exposure. A couple of studies done in the past establish that there is a link between educational level and food safety behavior. Individuals with high level of education tend to show high knowledge of food safety, favourable attitudes to food safety and better food safety practices than those with low or no formal education (Ali and Immanuel, 2017, Oranusi, Oguoma and Agusi, 2013). This result agrees with that of Chukuezi (2010), who found that food handlers had higher level of education. Other studies in Kenya, Ghana, Nigeria, India and Sudan described similar education profiles (Mensal *et al*., 2012; Donker *et al*, 2009; Omemu and Aderoju, 2008; Abdalla, Sulina and Bakhiet, 2009).

Primary occupation

Table 5.1 reveals that 47.4% of the respondents were engaged in farming as their primary occupation. This shows that farming is the predominant occupation in rural locations of the study area. Their engagement in farming could be as a result of the vast land resources available in the rural environment. It is also noted that rural dwellers engagement in farming had been the occupation they grew to take up because their parents were into it. This results is in agreement with the findings of Omonona, Obisesan and Aromolaran (2015), who found that the major occupation of rural households in Nigeria is farming.

Religion

Results in Table 5.1 reveals that 64.1% of the respondents were Christians 30.7% were Muslims, while 3.3% and 1.9% were traditional worshippers and atheist respectively. Religion practiced by the respondents is expected to have positive influence on their food safety behavior as most religions support personal hygiene like washing of hands covering

of hair and cutting of nails when cooking food etc. Furthermore some religious organizations do disseminate food safety information to their adherents. Hence, because majority belong to religious organization it is expected that they would likely keep up the position of this religion regarding food safety practices. This findings corroborates the assertion of Elena (2015), that religion has influence on an individual's food preferences and food handling practices.

Household size

Table 5.1 reveals that majority (71.7%) had between 3 and 7 persons in their household, with mean of 4.8±1.8. The low household size may be attributed to the appreciable level of educational attainment of the respondents, as emphasis is placed on care and upkeep as against large household size. It is plausible to say that the high cost of living in recent times that have forced some people to choose smaller family size. As households in this study had few family members to cater for, one would expect that the available family resources would be favourably deployed to provide necessary resources which would make it easier to adhere to food safety practices when compared to having larger households. One can posit that the shift towards smaller family size indicate a social transition that may likely enable the household to benefit from food safety practices. This result is similar to the finding of Ajibade *et al*, (2017), who found that an average Nigeria household size is between 4 and 6.

Income of the respondents.

Table 5.1 shows the distribution of the respondents based on their average monthly income. The result reveals that majority (63.7%) of the respondents earned between N30, 000 or less as monthly income. This is followed by the respondents who earns between ₦30, 001 – ₦42, 000 (25.9%).On the average the respondents' earned ₦33, 324 ±12,300. This implies that rural households in the study area may not likely provide safe food for their households as well as practicing food safety due to insufficient income and the prevailing rate of inflation in the country. Researchers on food safety practices (Ajayi and Salauden 2014, Borrusso and Quinlan 2013, Evans and Redmond 2014) assert that household income is one of the indicator used to determine the potential of households to provide wholesome food and to put in place necessary facilities that will influence food safety practices. Similarly,

Hendricks (2015) found that households experience difficulty in purchasing wholesome food for their family members due to insufficient income. Moreover, on food safety situation of the rural poor, the CDC (2016) found that 75% of the world's poor live in developing countries rural areas with low income and associated low purchasing powers, which increase the chances of consuming food of poorer quality that may well be also unsafe. This study agrees with the study of Nesamvuni (2014) who found that rural households in South Africa had low income and therefore have difficulty in purchasing safe food for their households. The above assertion is corroborated during an FGD participants who asserted that:

> *"we are poor it is the money at hand that would dictate the choice of food to buy, government should help us force down the price of food items we are hungry"(male and female participants, Ogbooro ward, Oyo State).*

Membership of social organization

The result in Table 5.1 reveals that more than half (55.5%) of the respondents belong to religious organization, this is followed by social organization with 31.9%. This implies that respondents in the study area strengthens their religious beliefs by associating themselves with religious organizations. Moreover, religious organization do serve as source of information on issues related to family upkeep and management especially for women. This is corroborated by an FGD session that:

> *"we join religious group because of religious reasons, and they do teach us how to prepare food safely for our children and husbands and to be a good wife and mother".(participants in Alabata, Odeda ward, Ogun State).*

This is one of the cultural characteristics of African people to live and participate in community life system is achieved by belonging to an organised religious or social organisation through which they get collective support both financially and emotionally (Olibie *et al*., 2013).

Table 5.1 Distribution of respondents by socio-economic characteristics

Variable	Categories	F	%	
Age (Years)	19-30	56	20.7	
	31-42	84	31.1	43±11.90
	43-54	74	27.4	
	>54	56	20.7	
Sex of respondents	Male	66	24.47	
	Female	204	75.67	
Marital status	Single	27	10.0	
	Married	22	82.2	
	Divorced	5	1.9	
	Widowed	16	5.9	
Duration of marriage (years)	≤ 13	131	48.5	
	14-26	76	28.27	16.51±13.1
	27-39	43	15.9	
	40-52	20	7.4	
Educational attainment	No formal education	69	25.6	
	Primary education	50	18.5	
	Secondary education	55	20.4	
	Tertiary education	96	35.6	
Years of formal education	None	69	25.6	
	1-6	62	23.0	8.5±6.3
	7-12	56	20.7	
	>12	83	30.7	
Primary occupation	Civil servant	45	16.7	
	Trading	53	19.6	
	Farming	128	47.4	
	Artisan	19	7.0	
	Driving	2	0.7	
	Priivate school teaching	23	8.5	
Religion	Christianity	173	64.1	
	Islam	83	30.7	
	Traditional	9	3.3	
	Athiest	5	1.9	
Household size	<3	62	23.0	
	3-7	192	71.1	4.8±1.8
	>7	16	5.9	
Average monthly income (₦)	<30,000	172	63.7	
	30,001-42,000	70	25.9	33,324±12,300
	42,001-54,000	27	10.0	
	>54,000	1	0.4	
*Membership of social organization	Religious organization	158	58.5	
	Social organization	86	31.8	
	Political organization	22	8.1	
	Cultural organization	11	4.1	

*Multiple response

Source: Field survey, 2017.

5.2: Sources of information on food safety practices used by the respondents

Table 5.2 shows that respondents accessed food safety information mostly through family and friends which was ranked 1st with the highest mean score of 1.62. This is followed by neighbours with a mean score of 1.44 and ranked 2nd. However, the least source of information used by the respondents was newspaper with a mean score of 0.08. The high access to family, friends and neighbours as sources of information on food safety could be as a result of strong family and social ties. It is a known fact that food safety practices are usually passed down from parents to their children. Children as they are growing up learn a great deal about daily life from their parents in which food handling and preparation are not exceptions. Moreover social norms as well as culture do affect food preparation and safety. The result also revealed that information on food safety was least accessed through the use of newspapers. This result is in agreement with Osagbemi (2010), Babalola, Babalola and Bassey (2010) and Whatley *et al*. (2015), who found that rural women access information on food safety from family, friends and neighbours.

Table 5.2: Distribution of respondents according to sources of information

Sources of information	Frequency of use				
	Never	Ocassionally	Always		
	F(%)	F(%)	F(%)	Mean	Rank
Friends and family	13(4.8)	76(28.1)	181(67.0)	1.62	1st
Neighbours	6(2.2)	139(51.5)	125(46.3)	1.44	2nd
Radio	30(11.1)	106(39.3)	134(49.6)	1.39	4th
Television	89(33.0)	82(30.4)	99(36.7)	1.04	5th
Health workers	31(11.5)	100(37.0)	139(51.5)	1.40	3rd
Newspapers	117(43.3)	84(31.0)	69(25.6)	0.82	7th
Non-governmental organizations	75(27.8)	151(55.9)	44(16.3)	0.89	6th
Phone	90(33.3)	150 (55.5)	30 (11.1)	0.78	8th
Social media	135(50.0)	120(44.4)	15(5.6)	0.55	9th

Source: Field Survey, 2017.

5.3: Food safety behaviour of the respondents

According to Thi Tra My (2015) KAP study model which stands for knowledge, attitude and practice are used to explore human behaviour concerning a topic of what the respondents know about it (K), how the respondents feel about it (A), what the respondents do about it (P). In order to know the behaviour of the respondents towards food safety, it is necessary to explore the interplay among the components of KAP to see how they interact to predict the necessary food safety behaviour required from the respondents.

5.3.1 Respondents' knowledge on food safety

Table 5.3 shows the distribution of respondents based on their knowledge of food safety. With respect to purchase and storage, majority of the respondents knew that stored food should be protected from dust, flies, rodents and pets ($\bar{x}$ =0.88), damaged and rotten food items should not be purchased ($\bar{x}$ =0.85) and that left over food should be eaten within one day ($\bar{x}$ =0.76). However, less than half (38.9%) of the respondents have the knowledge of how to prevent cross contamination of food ($\bar{x}$ =0.39). This result is in agreement with the findings of Fatemeh *et al.* (2017), who found high level of knowledge of the respondents on food purchase and storage.

On personal hygiene, majority of the respondents knew that hands should be washed with soap and clean water before eating ($\bar{x}$ = 0.88), kitchen area should be protected from insects,pests and domestic animals ($\bar{x}$ =0.80) and that dustbin should be kept outside the kitchen ($\bar{x}$ =0.78). However knowledge on washing of hands with soap and clean water before and after cooking was the least ($\bar{x}$ =0.52). This implies that the respondents don't consider washing of hands with soap and clean water to be an important aspect of food safety practices. The FGD result corroborates this assertion when one of the participant said that

> "*many at times, when I am in a hurry I do forget to wash my hands before cooking food*" *(male participant at Awo in Ekiti state).*

This assertion corroborates the findings of Young and Waddell (2016), who found that some unsafe food practices followed because of inconvenience, lack of time and negligence on the part of household food handlers.

With respect to cooking and food preparation,Table 5.3 shows that majority of the respondents knew that left-over is safe to eat after thorough re-heating ($\bar{x}$ =0.83), eating raw or undercooked food can predispose one to food-borne illness ($\bar{x}$ =0.82). However, respondents had the least knowledge that cooking while sick can contaminate food ($\bar{x}$ =0.51). This implies that rural household food handlers can be a source of food contamination. Literature has established it that food handlers who have infectious disease can transmit same to the household through food (Laxmi, 2016). This assertion is also supported during one of the FGD session that:

> "e*ven when I am sick I manage to cook food for my husband and children, or who will do it for me*" *(a female participant at Soku in Oyo West LGA).*

Similarly another participant said that:

> "*unless I am seriously sick, I still prepare food and my household have not been sick from the food I prepare*" *(a female participant at Awo, Ekiti State).*

The above assertion shows that respondents do not believe that they can contaminate food if they prepare food when they are sick. This is a bad practice as far as food safety is concerned, household food handlers did not percieve that they can transfer infectious disease to their households through this unsafe practice. Literature has it that food handlers may carry some human specific foodborne pathogens such as hepatitis A, Noroviruses, typhoidal salmonella, staphylococcus aureus and shigella species in their hands, cuts or sores, mouth, skin and hair (Addhakim (2014).

With respect to cross contamination of food,Table 5.3 reveals that majority of the respondents knew that cross contamination of food can occur when you put raw and cooked food together ($\bar{x}$ =0.86) and that eating food that has been contaminated can result in foodborne illness ($\bar{x}$ = 0.86). However, few respondents knew that plate used for raw food should be washed with soap and water before using it for cooked food ($\bar{x}$ = 0.21). This implies that cross-contamination of food from raw food to cooked food can occur. This could lead to food-borne illness at the household level. This finding is in line with the assertion of Young and Waddell (2016), who asserted that food contamination at the

household level was due to cross-contamination from raw food to cooked food as a result of unsafe food handling.In support of the above findings, during an FGD it was revealed that:

> "*many at times, we do not have money to buy soap that is why we use only water and thank God we have not been sick (participants at Ajaawa in Ogo Oluwa LGA of Oyo State).*

On the overall, knowledge on personal hygiene ($\bar{x}$ = 0.72) was highest, followed by cooking and food preparation ($\bar{x}$ =0.69), then purchase and storage ($\bar{x}$ =0.68), while knowledge on cross-contamination ($\bar{x}$ =0.64) was the least.

The knowledge on personal hygiene being demonstrated by the respondents may be as a result of the general concept of hygiene they had and not necessarily on food safety alone. This line of thought is in consonant with the assertion of Young and Waddell (2016), who assert that consumers knowledge about safe food handling practices (such as sanitation and cleanliness) were followed often from the perspectives of common sense and for general hygiene purposes rather than explicitly as a food safety practice.

The respondents low knowledge on cross-contamination is supported by the result of Tran Ngoc (2015), who found that 90.4% of women food handlers did not know the meaning of cross-contamination.

Table 5.3: Distribution of respondents according to their food safety knowledge

	Statement	Incorrect F (%)	Correct F (%)	Mean	Rank
	Purchase and Storage				
1.	What do you consider most important when purchasing food items	126(46.7)	144(53.3)	0.53	4th
2.	Stored food should be protected from dust, flies and pests.	32(11.9)	238(88.1)	0.88	1st
3.	Raw meat should be stored at the bottom of cooked food	165(61.1)	105(38.9)	0.39	5th
4.	To avoid food contamination, leftover food should be eaten within one day	64(23.7)	206(76.3)	0.76	3rd
5.	Food items that are damaged or rotten should not be purchased	39(14.4)	231(85.6)	0.85	2nd
	Grand mean			**0.68**	**3rd**
	Personal hygiene				
1.	It is safe to wash your hands thoroughly with soap and water before and after cooking food	130(48.1)	140(51.9)	0.52	6th
2.	Dishes should be washed with soap and water	110(40.7)	160(59.3)	0.59	5th
3.	Kitchen area should be protected from pests and domestic animals	54(20.0)	216(80.0)	0.80	2nd
4.	In order not to contaminate food, hands should be washed before eating	31(11.5)	239(88.5)	0.88	1st
5.	Hands should be washed thoroughly with soap and water after using the toilet	68(25.2)	202(74.8)	0.75	4th
6.	Dustbin should be kept outside the kitchen	58(21.5)	212(78.5)	0.78	3rd
	Grand mean			**0.72**	**1st**

	Cooking and food preparation				
1.	Water from streams / wells are safe for drinking after boiling it	99(36.7)	171(63.3)	0.63	4th
2.	Fresh fruits and vegetables are safe to eat after washing it with clean water	59(21.9)	211(78.1)	0.78	3rd
3.	Meat is properly cooked when there is no blood or pink colour in it	102(37.8)	168(62.2)	0.62	5th
4.	Leftover food is safe to eat after thorough reheating	46(17.0)	224(83.0)	0.83	1st
5.	Eating raw or undercooked food can predispose one to food-borne illness	47(17.4)	223(82.6)	0.82	2nd
6.	It is not safe to cook food when you are sick so that you will not contaminate food	132(48.9)	138(51.1)	0.51	6th
	Grand mean			**0.69**	**2nd**
	Cross contamination				
1.	Cross-contamination of food can occur when you put raw and cooked food together	38(14.1)	232(85.9)	0.86	1st
2.	Plate used for raw food should be washed with soap and water before using it for cooked food	213(78.9)	57(21.1)	0.21	3rd
3.	When food that are cross-contaminated are eaten it can cause food-borne illness	37(13.7)	233(86.3)	0.86	1st
	Grand mean			**0.64**	**4th**

5.3.1.2 Categorisation of respondents based on their knowledge of food safety

Table 5.4 reveals the categorisation of the respondents based on their knowledge of food safety across four domains (food purchase and storage, personal hygiene, cooking and food preparation and cross contamination).

The result reveals that majority (63.7%) of the respondents had high level of knowledge on food safety, while 36.3% had low level of knowledge. The high knowledge of food safety observed could be as a result of their educational exposure over time. The knowledge received would also have been complemented with their access to information on food safety received via several media, thus the rich knowledge base of the respondents was observed. As respondents demonstrate high knowledge of food safety one would expect that this knowledge would provide the respondents with some motivation to practice food safety. Knowledge of food safety is essential for consumers to make informed choices and implement safe food handling practices. Therefore, accuracy and extent of knowledge become very important in enabling the respondents to make informed choices for the food safety actions and to implement adequate and proper food safety practices (Clayton *et al.*, (2012). Similarly, Diplock *et al,* (2015) found that the provision of knowledge on the rationale for hand-washing contributed to an increase hand-washing compliance of food handlers. However some studies in the past established the fact that knowledge of food safety does not necessarily translate to food safety practices by the food preparers (Meysenburg *et al.* 2014, Augustina *et al.* 2013 and Gunsam & Mohammed 2012).

This result is also in agreement with the findings of Akabonda, Hlortsi and Kwarteng (2017), and Odeleye (2015). However, contrary to this result Unusan (2007) reported a low level of knowledge compared to reported food handling practices.

Table 5.4 Categorisation of respondents according to knowledge on food safety

Knowledge of food safety	Frequency	Percentage	Min.	Max.	Mean	SD
High	172	63.7	2.00	19.00	13.89	3.73
Low	98	36.3				

Source: Field Survey, 2017.

5.3.2 Respondents' attitude to food safety practices

Table 5.5 reveals that majority of the respondents strongly agreed that hands should be washed before and after food preparation ($\bar{x}$ =4.50), fruits and vegetables should be kept in a cool place ($\bar{x}$ =4.46), meat should be thoroughly cooked to prevent food borne illnesses ($\bar{x}$ =4.39), fresh and wholesome food should be purchased ($\bar{x}$=4.39), fruits and vegetables should be washed thoroughly with clean water ($\bar{x}$ =4.33), old food items should be used before new ones ($\bar{x}$ =4.07) and separation of raw food from cooked food to prevent food contamination ($\bar{x}$ =4.07).

It may be adduced that the knowledge of food safety practices acquired by the respondents would have informed the modification of the respondents' attitude towards these activities. It is noted that the shaping of behaviour of people towards particular activities is often informed by initially receiving information about the activity before any meaningful change in behavior (attitude) can take place. This assertion is supported by a female participant during an FGD session who said that:

> *"I did not know that not separating raw food from cooked food was entirely bad and can predispose me and my entire household to food- borne illnesses not until I got information from a health officer" (participant at Agbede in Imeko Afon LGA in Ogun state)*

This result agreed with the findings of Kumera, Belay and Tefera (2017), Hui, Hisha muddin, Kwai and Lay (2017), who reported that majority of the food handlers had favourable attitude towards hand washing before and during food preparation, cooking meat thoroughly and purchasing of fresh and wholesome food.

However respondents were least favorably disposed to boiling of water from stream/well before drinking it ($\bar{x}$ =3.37), avoiding cross contamination of food ($\bar{x}$ =3.33) and using of different knives for raw and cooked food ($\bar{x}$ =3.23).

This implies that the respondents don't believe that by not practicing these activities could lead to food-borne illness outbreaks in their households. The FGD corroborate this finding:

“We don’t have separate knife for raw and cooked food we just rinse the knife in water after using it for raw food before using it for cooked food”.(a female participant at Oje Owode in Saki East LGA, Oyo State).

Table 5.5: Distribution of respondents according to their attitude to food safety

s/n	Attitudinal statements	Response options					
		SA	A	U	D	SD	Mean
		F (%)	F (%)	F (%)	F (%)	F (%)	
1.	Frequent handwashing during food preparation is a worthwhile practice	176 (65.2)	68 (25.2)	16 (5.9)	6 (2.2)	4(1.5)	4.50
2.	Keeping kitchen surfaces clean cannot reduce the risk of food borne illnesses	39(14.4)	47(17.4)	18(6.7)	44(16.3)	122(45.2)	3.60
3.	Separating raw and cooked food helps prevent food borne illnesses	109(40.4)	113(41.9)	20(7.4)	13(4.8)	12(4.4)	4.07
4.	Using different knives for raw and cooked food cannot prevent food borne illnesses	71(26.3)	22(8.1)	22(8.1)	85(31.5)	70(25.9)	3.23
5.	Cooking meat thoroughly can prevent food borne illnesses	163(60.4)	72(26.7)	17(6.3)	14(5.2)	4(1.5)	4.39
6.	Drinking water from well/stream cannot predispose one to food borne illnesses	51(18.9)	50(18.5)	19(7.0)	48(17.8)	102(37.8)	3.37
7.	Fruits and vegetables should be kept in a cool place	184(68.1)	49(18.1)	21(7.8)	9(3.3)	7(2.6)	4.46
8.	It is safer to leave cooked food for a long time before eating it	24(8.9)	23(8.5)	23(8.5)	85(31.5)	115(42.6)	3.90
9.	Buying of fresh and wholesome food is very important	167(61.9)	56(20.7)	27(10.0)	11(4.1)	7(3.3)	4.33
10.	Coughing and sneezing when cooking can contaminate food	93(34.4)	97(35.9)	43(15.9)	19(7.0)	18(6.7)	3.84
11.	It is safer to serve food when it is hot to prevent food contamination	97(35.9)	63(23.3)	41(15.2)	27(10.0)	42(15.6)	3.54
12.	Leftovers are safe to eat without thorough re-heating	43(15.9)	57(21.1)	39(14.4)	27(10.0)	104(38.5)	3.34
13.	Fruits and vegetables should be washed thoroughly with clean water	122(45.2)	82(30.4)	37(13.7)	8(3.0)	21(7.8)	4.02
14.	It is not important to clean cooking utensils after use	38(14.1)	14(5.2)	32(11.9)	59(21.9)	127(47.0)	3.83
15.	It is not necessary to cover food properly before storing it	35(13.0)	39(14.4)	30(11.1)	87(32.2)	79(29.3)	3.50
16.	Old food items should be used up before new ones	104(38.5)	110(40.7)	28(10.4)	16(5.9)	12(4.4)	4.07
17.	Cross contamination of food is likely to occur when you touch raw food and then touch cooked food	75(27.8)	77(28.5)	28(10.4)	43(15.9)	47(17.4)	3.33

Source: Field survey,2017. * SA (Stronly agree) A (Agree) U (Undecided) D (Disagree) SD (Strongly disagree)

5.3.2.1 Categorization of respondents by their attitude to food safety practices

Figure 5.1 shows that 41.1% of the respondents had favourable attitude to food safety practices while 58.9% had unfavourable attitude to food safety practices. This result implies that respondents may not be aware of safety practices. This unfavourable stance might lead to compromise in their food safety practices. The effect of this can lead to foodborne illness which will in turn negatively affect their health status. The unfavourable attitude observed may be as a result of their hard held belief. Making a case for this negative attitude, the Food Agency of Nigeria (2009), posit that attitude to food safety are influenced by a complex array of factors and processes. Among these are; demographic factors, familial and household influences, habit, health consideration, ethical concerns and wider societal trends. In the same vein, Bamidele *et al.* (2016) assert that many factors ranging from ignorance, uncaring and poor attitudes to personal hygiene, lack of basic hygiene infrastructure and sanitary facilities such as water, soap and toilet, all contributed to poor attitude towards food safety practices among food handlers. This result is in agreement with the findings of Sofela *et al.* (2014) on food hygiene and safety practices of food handlers and its determinants in Lagos State, where most (55%) of the respondents had good knowledge of food safety but majority (76%) had negative attitude towards food safety practices. Similarly, in a study done by Jai (2010) on food handlers attitude to food safety practices found that personal hygiene practice and keeping food at safe temperature were not the contributing factors to food safety attitude. However, this result contradicts the findings of Magda *et al.* (2014) and Whatley *et al*. (2014), who found higher score of attitude among the food handlers.

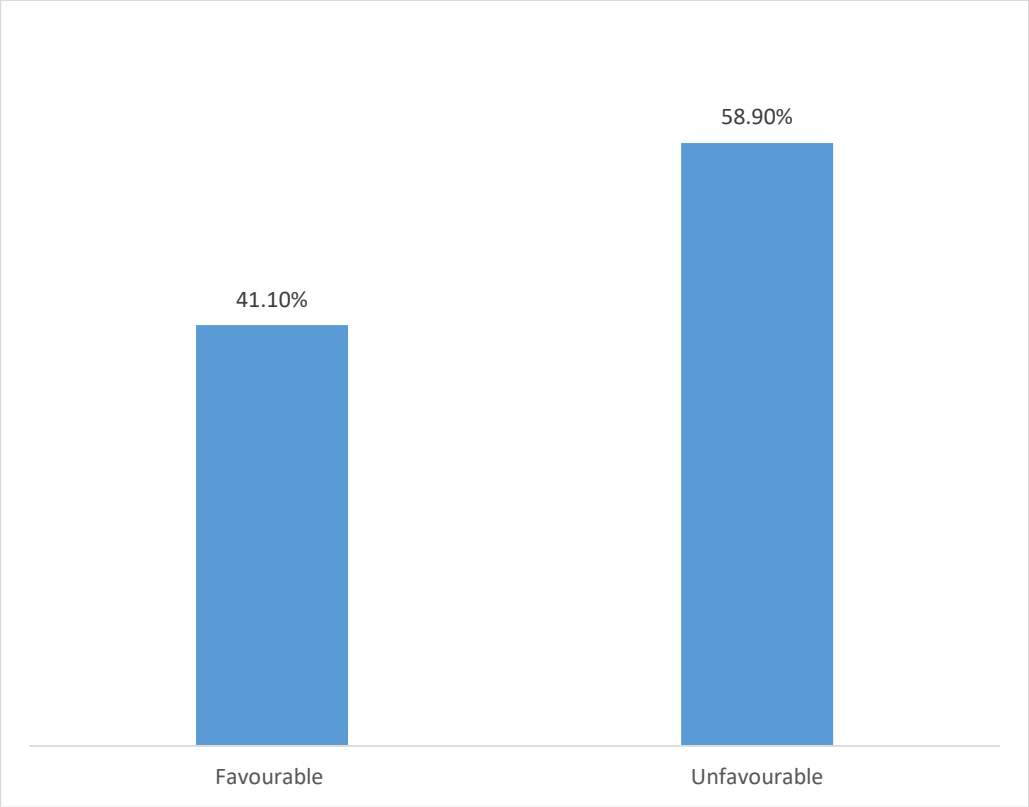


Figure 5.1 Categorization of respondents according to their attitude to food safety
Source: Field Survey, 2017.

5.3.3 Respondents food safety practices

Table 5.6 shows the distribution of respondents according to their food safety practices. With respect to purchase and storage component of food safety, protecting food from flies, pests and rodents ($\bar{x}$= 1.75), purchase of fresh and wholesome food ($\bar{x}$= 1.67) ranked highest as food safety practices observed by the respondents. The observation of those practices depict that the respondents are knowledgeable about the health risk that can result if their food is contaminated by these organisms. It is noted that these organisms are carriers of pathogens that are responsible for causing food borne illness (Nesamvuni, 2014). The above assertion is supported by the findings of Takanashi *et al*. (2013), Toure, (2013) and Islam and Abdullahi (2013) who posited that in order to decrease the risk of foodborne illnesses at the household level, fresh and wholesome food, kept from pests, flies etc. must be purchased by home food handlers. However, Denloye (2012) observed that high rate of poverty in Nigeria has prevented some households from purchasing fresh and wholesome food for their families. Also notable as practices observed by the respondents under purchase and storage are keeping of raw foods from ready to eat food while shopping ($\bar{x}$ = 1.56) and storing food separately from cooked food ($\bar{x}$= 1.56). From the foregoing, it is plausible to admit that the risk of food spoilage as a result of cross contamination is most likely not possible as they adhere to those practices. Consumption of left overs within one day was the least practiced ($\bar{x}$ = 1.47). This implies that, rural households in the study area are prone to or susceptible to food borne illnesses and other health risk factors. According to WHO (2015), leaving food unconsumed within one day is one of the risk factor for contacting food borne disease. This result agrees with that of Motta *et al*. (2014) who found contrary practices among home food handlers in handling left overs.

Table 5.6 also revealed that washing of hands after handling rubbish or using the toilet ($\bar{x}$ = 1.87), washing and cleaning of kitchen surfaces and utensils ($\bar{x}$ = 1.77) ranked highest as practices observed by the respondents under the personal hygiene sub component of their food safety practices. From the foregoing, it can be established that the respondents appreciate the role played by these practices in preventing food related illnesses hence the high observance of those practices where recorded.

This result agrees with the studies of Kumera, Belay and Tefera (2013) who reported that 87-92% of the food handlers indicated that they wash their hands after handling garbage or raw meat. Personal hygiene especially hand hygiene has been recognized as the most basic and critical criterion for ensuring safe food handling by the food handlers (Hui *et al*., 2017). Also, hand washing has been known to be a fundamental precautionary measures in health care settings as well as in the kitchen for preventing the spread of infectious diseases through human to human or human to food. Chunakwe *et al* (2013), posits that hand hygiene could serve as an indicator of food handler adherence to food safety practices during food preparation. This is because hands come into contact with body parts, structural surfaces in the kitchen, as well as raw food and food preparation surfaces and utensils. In line with the above position, researchers in the field of food safety and public health (Hui *et al*. 2017, Green *et al*. 2007), have recommended that hand washing should precede each of the activities involved in food preparation in order to prevent food contamination from food handlers hands. In addition to washing of hands, environmental hygiene is also very important in the prevention of foodborne illnesses. In the course of data collection for this study, the researcher observed that the environmental condition in most rural communities visited was an eyesore as there were no proper waste disposal mechanism, running gutters are dirty and smelling, faeces of goats and chicken littering the surrounding. In line with this observation, Rheinlander *et al*. (2015) observed that most rural households are living in an area marked by unsanitary conditions like poor drainage systems, poor waste disposal which leads to poor hygiene (personal and environmental). This serves as breeding ground for disease vectors and other microorganisms that can contaminate food resulting in food poisoning leading to serious health problems and occasionally death. Therefore, food behaviours and breaches of good hygiene practice can predispose consumers to a number of health consequences. It is also important to note that 90% of the food safety problems are as a result of poor personal hygiene (Jai, 2010).

Also reported practices adhere to were washing of fresh fruit and vegetable with clean water ($\bar{x}$ = 1.64) and washing of hands with soap and water during food preparation ($\bar{x}$ = 1.57). It is noted that the adherence of the respondents to those practices can be traced to their appreciation of those practices as measures aimed at preventing foodborne illness. It is noted that some dirt's stick to the surfaces of fruits and vegetables as a result of poor

handling, hence the washing of those fruits and vegetables will guarantee their wholesomeness. However, boiling of water from well/stream before drinking ($\bar{x}$ = 1.41) and allowing pets to eat from the same utensils meant for humans ($\bar{x}$ = 0.41) were least practiced by the respondents. It is noted that respondents non-adherence to the boiling of water from well/stream before drinking it will further predispose them to water borne illnesses, as pathogen do not thrive under extreme temperature. Respondents' observation of keeping away utensils meant for humans from pets is applauded as the respondents will be shielded from the transfer of zoonotic diseases.

With respects to cooking and food preparation component of food safety practices Table 5.5 reveals that using clean and safe water for cooking ($\bar{x}$ = 1.86), cooking meat thoroughly with no pink colour or blood ($\bar{x}$ = 1.82) and reheating of leftover food before eating it ($\bar{x}$ = 1.76) ranked highest as practices observed by the respondents

This implies that as respondents use clean and safe water for cooking their food, foodborne outbreak at the household level is prevented and their household health is secured. Furthermore, thorough cooking of meat/food to required temperature helps in killing the pathogens that may reside in the food. It is acknowledged that with their observance of these practices the food the respondents consume is devoid of pathogens. Motta *et al.* (2014), in their study found that improper food preparation and cooking contribute 38.3% to food contamination in the home. In the same vein, Ali and Emmanuel (2017), identified inadequate cooking and improper food preparation practices cum unsafe water for cooking as one of the significant origin of food contamination, pathogens growth and survival. Moreover, meat/poultry that is improperly cooked and consumed can directly introduce food borne pathogens into the consumers' digestive system causing such symptoms as diarrhea, nausea and vomiting (Akpe *et al*., 2016).

Table 5.6 also reveals that covering skin infections, cuts, grazes when cooking ($\bar{x}$ = 1.56), covering of hair, cut nails clean before food preparation were least practiced by the respondents. It is noted that their non-observance of those practices would expose their food to contaminants as germs and dirt's are common features of long nails, cut surfaces and skin infections. According to Rafiq and Itrat (2017), food handlers must be aware of cuts and abrasions since they are sources of bacteria. Food handler who has infected wounds

should not prepare food or touch food utensils as this can transfer harmful bacteria from the infected wound to food or utensils.

With respect to cross contamination component of food safety practices washing of plates used for raw food with soap and water before using it for cooked food ($\bar{x}$ = 1.73), and keeping of raw food separate from cooked food ($\bar{x}$ = 1.69) were prominent as food safety practices observed by the respondents. This implies that the respondents are knowledgeable about the precautions to take during food preparation in order to prevent cross contamination of food thus they were able to practice it. The common cause of cross contamination in the kitchen is when contaminated hands and equipment are used to prepare cooked and raw food at the same time. Another cause of cross contamination is when raw foods are stored adjacently to or above ready to eat foods in a refrigerator or other holding equipment (Zain & Naing 2012). Similarly, Jai, (2010) posited that the common cause of cross-contamination in the kitchen is because contaminated hands and utensils are used in food preparation. Suffice to say that as the households sustains this practice the more they will be free from foodborne illness and therefore enjoy good health.

Based on the four keys used in this study to measure the food safety practices of the respondents, prevention of cross contamination of food (1.71) was the most food safety practice adhered to, followed by cooking and food preparation (1.70), then purchase and storage (1.59), while the least was personal hygiene (1.45). This implies that the respondents do take necessary precautions to prevent their food from being contaminated by unwashed kitchen utensils, pest and pets. Based on the above result, there is the need to sensitise rural household food handlers on importance of personal hygiene.

Table 5.6 : Distribution of respondents according to their food safety practices

s/n	Statements	Response options			Mean	Rank
		Always f (%)	Ocassionally f (%)	Never f (%)		
A.	**Purchase and Storage**					
1.	Protecting food from flies, pests and rodents	221 (81.0)	31 (11.5)	18 (6.7)	1.75	1st
2.	Purchase of fresh and wholesome foods	188 (69.6)	74 (27.4)	8 (3.0)	1.67	2nd
3.	Keeping of raw foods from ready to eat food while shopping	163 (60.4)	94 (34.8)	13 (4.8)	1.56	3rd
4.	I store raw food separate from cooked food	173 (64.1)	76 (28.1)	21 (7.8)	1.56	3rd
5.	I throw away mouldy foods	165 (61.1)	89 (33.0)	16 (5.9)	1.55	5th
6.	I consume leftovers within one day	140 (51.9)	117 (43.3)	13 (4.8)	1.47	6th
	Grand mean				**1.59**	**3rd**
B	**Personal Hygiene**					
1.	Wahing of hands after handling rubbish or using the toilet	239 (85.5)	28 (10.4)	3 (1.1)	1.87	1st
2.	Washing and cleanng up kitchen surfaces and utensils	214 (79.3)	51 (18.9)	5 (1.9)	1.77	2nd
3.	Washing fresh fruits and vegetables with clean water	197 (73.0)	49 (18.1)	24 (8.9)	1.64	3rd
4.	Washing of hands with soap and water during food preparation	167 (61.9)	91 (33.7)	12 (4.4)	1.57	4th
5.	Boiling of water from well/stream before drinking it	172 (63.7)	38 (14.1)	60 (22.2)	1.41	5th
6.	Alowing pets to eat from the same utensils meant for humans	39 (14.4)	33 (12.2)	198 (73.3)	0.41	6th
	Grand mean				**1.45**	**4th**
C	**Cooking and food preparation**					
1.	Using claean and safe water for cooking	240 (88.9)	21 (7.8)	9 (3.3)	1.86	1st
2.	Cooking meat thoroughly with no pink colour or blood	229 (84.8)	33 (12.2)	8 (3.0)	1.82	2nd
3.	Re-heating left over food before eating it	214 (79.3)	46 (17.0)	10 (3.7)	1.76	3rd
4.	Washing of dishes with water and soap	223 (82.6)	26 (9.6)	20 (7.4)	1.75	4th
5.	Covering skin infections,cuts and grazes when cooking	177 (65.6)	67 (24.8)	26 (9.6)	1.56	5th
6.	Covering of hair and cutting of nails before cooking	178 (65.9)	39 (14.4)	53 (19.6)	1.46	6th
	Grand mean				**1.70**	**2nd**
D	**Cross contamination**					
1.	Washing of plates used for raw food with soap and water before using it for cooked food	210 (77.8)	46 (17.0)	14 (5.2)	1.73	1st
2.	Keeping raw food separate from cooked foods	212 (78.5)	32 (11.9)	26 (9.6)	1.69	2nd
	Grand mean				**1.71**	**1st**

Source: Field survey,2017.

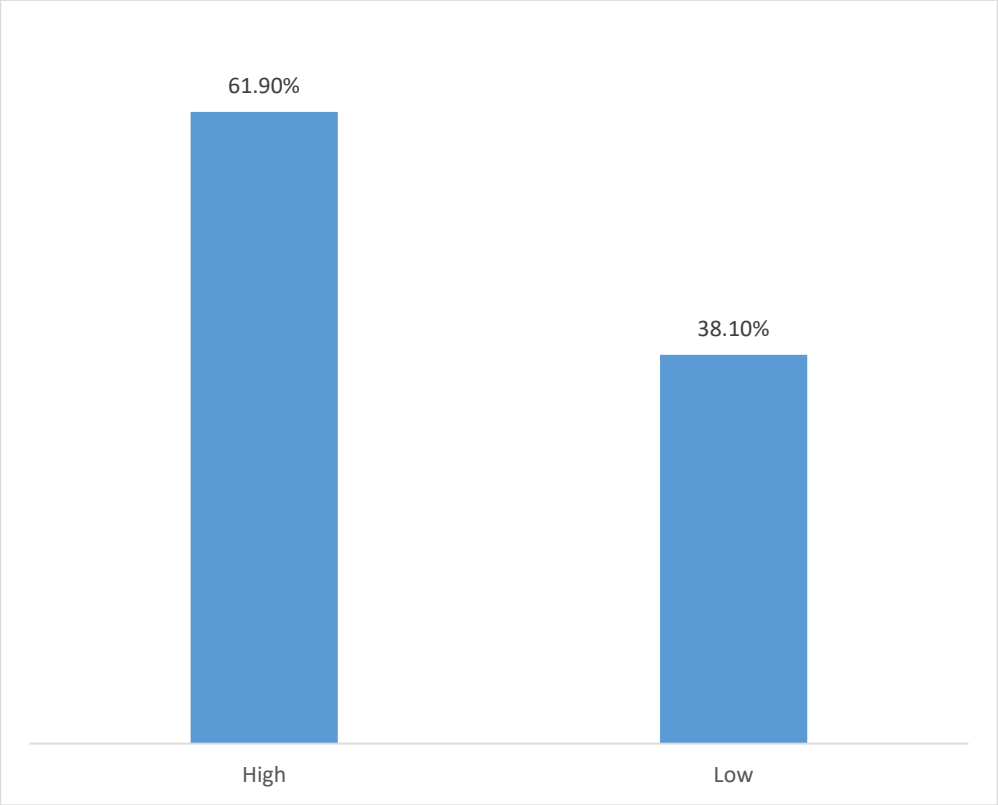
5.3.3.1 Categorisation of the respondents based on their food safety practices

Figure 5.2 reveals that majority (61.9%) of the respondents had high level of food safety practices, while 38.1% had low level of food safety practices. The high level of food safety practices among the respondents despite the fact that majority had unfavourable attitude to food safety show that attitude is not the only factor that can influence practice. There are other factors such as familiar and household influences, demographic factors or past experience of health hazard from eating unsafe food might be responsible for this finding. This result also suggest that they are more concerned about the safety of food for their households. WHO (2015) assert that people do care about the safety of the food they consumed now, more than a decade ago. It is also a known fact that, food-borne illnesses are preventable by taking precautionary measures especially during cooking and food preparation (Bamidele *et al*., 2016). Moreover, suffice to say that respondents are aware of the consequences and danger inherent in engaging in risky behaviour that can predispose their households to health hazards as a result of food borne illnesses. Having taken cognizance of this fact by engaging in food safety practices, their households will enjoy good health. This assertion is corroborated during an FGD session at Baagbo community in Ogun State.

> *"Nowadays diseases of different types are rampant one should be careful to prepare safe food at home" (participant at Baagbo, Ogun state).*

Motta *et al.* (2014) assert that the safety of food at the moment of consumption is critical for human health and depends on many variables which may include: criteria for checking the safety of food ingredients when choosing and purchasing food, food transportation, storage and preservation of food, food preparation and cooking, the exposure of food to a dangerous temperature, the handling of leftovers, kitchen facilities and the use of kitchen appliances, personal hygiene and the basic health care of food handlers. These are likely contributing factors to food-borne illness occurrence in the home. Suffice to deduce from the above that consumers/food handlers are very critical in the prevention of foodborne illnesses. They are the final link in the food chain (farm to fork) and therefore must take cognizance of the above factors and put in necessary checks by defying all odds to

practicing food safety for promoting the health of individuals in the home. In support of this view, Motta *et al.* (2014) in their study of consumers contribution to food contamination found that consumers choice and purchase of food contributed 22.8%, food transportation 38.9%, food safety knowledge of consumers 29.8%, storage and preservation of food 29.2%, food preparation and cooking 38.3%, handling leftovers 45.9%, kitchen facilities and use of kitchen appliances 34.1%, personal hygiene and basic health care 29.1% to food contamination respectively. Therefore, taking cognizance of the critical position of food handlers in ensuring safety of food especially at the household level, it is pertinent as a matter of urgency to boost the basic knowledge of food handlers on food safety practices. Moreover, they should be empowered through education and intervention programmes that will aid the practice of food safety on a continuous basis to promote the health of rural household.



Field Survey: 2017

Figure 5.2 Categorisation of respondents according to their food safety practices

5.3.4 Respondents food safety behaviour

Table 5.7 shows the categorization of the respondents based on their food safety behaviour. Majority (56.3%) of the respondents had appropriate food safety behaviour, while 43.7% had inappropriate food safety behaviour. It can be inferred that the appropriate food safety behaviour demonstrated by the respondents could be attributed to the interrelationship of their food safety knoweldge, attitutde and practices. It is also believed that food safety knowledge, attitude and practices do influence food safety behaviour (Karen, 2015). Suffice to say that as respondents demonstrate appropriate food safety behaviour the rate of food-borne illness outbreaks at household level will be greately reduced. Conversly, inappropriate food safety behaviour of food handlers in the kitchen can aggravate food safety risks (Unusan, 2007). This will enhance and promote healthiness among household members. This assertion is coroborated by the findings of Al Shakkaf (2013), that appropriate food safety behaviour could help to mitigate/prevent the rate of food-borne illness outbreaks at the households level.

Table 5.7 Categorisation of respondents by their food safety behaviour

Food safety behaviour	F	%	Min	Max	Mean	SD
Inappropriate	118	43.7	0.00	11.13	6.5	2.21
Appropriate	152	56.3				
Total	270	100.0				

5.4 Perceived food-borne illnesses experienced by rural households

Table 5.8 reveals the food-borne illnesses experienced by the respondents. It reveals that fever chills (62.6%) was the food-borne illness mostly experienced by the respondents. This is followed by abdominal cramping (50.4%), retarded growth (36.7%) and diarrhoea (36.3%). This finding agrees with the study of Nesamvuni (2014), who found that fever chills, abdominal cramping,diarrhoea and worm in stool are the most common clinical symptoms of food-borne illnesses in the homes. The table also reveals that cholera (90.0%)and arthritis (89.6%) were least experienced by the rural households. The reason why cancer and arthritis are less experienced by rural households may be due to the fact they are secondary stage of food-borne illness (WHO,2015).

Table 5.8 Distribution of respondents based on food-borne illnesses experienced

s/n	Food borne illness	Experienced F(%)	Not experienced F(%)
1.	Diarrhoea	98(36.3)	172(63.7)
2.	Dysentry	91(33.7)	179(66.3)
3.	Nausea	50(18.5)	220(81.5)
4.	Vomiting	55(20.4)	215(79.6)
5.	Abdominal cramping	136(50.4)	134(49.6)
6.	Blood in stool	46(17.0)	224(83.0)
7.	Typhoid	79(29.3)	191(70.7)
8.	Cholera	27(10.0)	243(90.0)
9.	Jaundice	30(11.1)	240(88.9)
10.	Cancer	19(7.0)	251(93.0)
11.	Arthritis	28(10.4)	242(89.6)
12.	Neurological disorder	30(11.1)	140(88.9)
13.	Sore throat	84(31.1)	186(68.9)
14.	Fever chills	169(62.6)	101(37.4)
15.	Retarded growth	99(36.7)	171(63.3)

Source: Field survey, 2017

5.5. Frequency of perceived food-borne illnesses experienced by rural households

Table 5.9 reveals that fever chills ($\bar{x}$ =1.07), abdominal cramping ($\bar{x}$ =0.92), dysentery ($\bar{x}$ = 0.79), diarrhea ($\bar{x}$ = 0.79) and typhoid ($\bar{x}$ = 0.64) were food-borne illnesses frequently experienced by the respondents in the last six months. It is acknowledged that those illnesses are mostly associated with food-borne illnesses as they are commonly experienced when contaminated food item including fruits and vegetables are consumed (Hui *et al*, 2017). Also serving as precursor to these illnesses is the consumption of improperly cooked food. This results corroborates the assertion of Addis and Sisay (2015), that the most common clinical symptoms of foodborne illnesses are fever chills, abdominal cramping, diarrhea, dysentery and nausea. They went further to state that diarrhea are responsible for half global burden of foodborne diseases caused by thirty one hazards. WHO (2016), also affirmed that meat or poultry that is improperly cooked and consumed can directly introduce the food-borne pathogens to the consumers digestive system causing such symptoms as diarrhea, nausea, vomiting and fever chills.

Table 5.9 Frequency of food-borne illnesses experienced

s/n	Food borne illnesses	Weekly	Forthnightly	Monthly	Once in 3 month	Once in 6 months	Not at all	Mean	Rank
1.	Diarrhoea	18 (6.7)	2 (0.7)	6 (2.2)	13 (4.8)	59 (21.9)	173 (63.7)	0.74	4th
2.	Dysentry	3 (1.1)	17 (6.3)	11 (4.1)	37 (13.7)	23 (8.5)	179 (66.3)	0.79	3rd
3.	Nausea	10 (3.7)	1 (0.4)	10 (3.7)	9 (3.3)	20 (7.4)	220 (81.5)	0.45	9th
4.	Vomitting	10 (3.7)	5 (1.9)	5 (1.9)	13 (4.8)	22 (8.1)	215 (79.6)	0.49	8th
5.	Abdominal cramping	5 (1.9)	13 (4.8)	19 (7.0)	16 (5.9)	83 (30.7)	134 (49.6)	0.92	2nd
6.	Blood in stool	3 (1.1)	9 (3.3)	6 (2.2)	13 (4.8)	15 (5.6)	224 (83.0)	0.41	10th
7.	Typhoid	6 (2.2)	9 (3.3)	6 (2.2)	30 (11.1)	28 (10.4)	191(70.7)	0.64	5th
8.	Cholera	4 (1.5)	9 (3.3)	3 (1.1)	7 (2.6)	4 (1.5)	243 (90.0)	0.31	13th
9.	Jaundice	3 (1.1)	8 (3.0)	7 (2.6)	6 (2.2)	6 (2.2)	240 (88.9)	0.34	11th
10.	Cancer	2 (0.7)	8 (3.0)	4 (1.5)	4 (1.5)	1 (0.4)	251 (93.0)	0.23	15th
11.	Arthritis	7 (2.6)	4 (1.5)	6 (2.2)	8 (3.0)	3 (1.1)	242 (89.6)	0.32	12th
12.	Neurological disorder	4 (1.5)	8 (3.0)	3 (1.1)	4 (1.5)	11 (4.1)	240 (88.9)	0.29	14th
13.	Sore throat	6 (2.2)	3 (1.1)	12 (4.4)	19 (7.0)	44 (16.3)	186 (68.9)	0.59	6th
14.	Fever chills	5 (1.9)	11 (4.1)	12 (4.4)	42 (15.6)	99 (36.7)	101 (37.4)	1.07	1st
15.	Retarded growth	3 (1.1)	5 (1.9)	7 (2.6)	17 (6.3)	67 (24.8)	171 (63.3)	0.58	7th

Source: Feield Survey, 2017.

5.7 Constraints to food safety practices experienced by the respondents

Table 5.10 reveals the constraints faced by respondents on food safety practices. Lack of infrastructure ($\bar{x}$ = 1.26), followed by inadequate finance ($\bar{x}$ = 1.06) and cumbersome nature of food safety practices ($\bar{x}$ = 0.86) were most prominent constraints to adhering to food safety practices. It is acknowledged that source of water, electricity and waste disposal sites are necessary infrastructure that will encourage the respondent in adhering to food safety practices. However, the lack/inadequate availability of those infrastructure did serve as hindrance to observing food safety practices. Another constraint to food safety practices observed in this study was poor financial status of the respondents this may prevent them from purchasing wholesome food for their household. It is also noted that finance is needed to purchase necessary kits and items (napkin, soap, detergents) needed to ensure adequate adherence to food safety practices. Also observed as constraint to food safety practices was the cumbersome nature of food safety practices. It is acknowledged that the rural populace have timelines for their daily activities, hence incorporating those time demanding food safety practices would be an issue to them. This is corroborated during one of the FGD sessions when one of the participants said that:

> *"I have been cooking for years now and my household have never been sick from the food I prepare I don't have time to observe all those rules of do and don'ts of food safety practices."*(a participant at Alagbagba in Odeda LGA of Ogun State).

In Nigeria as noted by Ifenkwe (2012), many rural and sub-urban regions lack essential amenities and adequate enlightenment or sensitization on the importance of food safety. Specifically, amenities such as electricity, portable water, toilet facilities, waste disposal etc. are lacking in Nigeria. The implication of this is that people in rural communities have the tendency to engage in unsafe food safety practices that can negatively affect their health status. Thus there is the need to provide basic infrastructures that will aid the practice of food safety in the rural areas. This result agrees with the findings of Boro *et al.* (2015) and Fasoro *et al*. (2015) who found that lack of basic infrastructure was a major constraints to food safety practices. Cultural values and socials norms were not considered as major

constraints by the respondents. This implies that respondents do have control over these, probably due to technological advancement that have pervaded all areas of life including what people eat.

Table 5.10 Distribution of respondents based on their constraints to food safety practices

	Constraints	Not a constraints f (%)	Mild constraint f (%)	Severe constraint f (%)	Mean	Rank
1.	Inadequate finance	54 (20.0)	55 (20.4)	161(59.6)	1.06	2nd
2.	Inadequate infrastructure	45 (16.7)	109 (40.5)	116 (43.0)	1.26	1st
3.	Cumbersome nature of food safety practices	76 (28.1)	156 (57.8)	38 (14.1)	0.86	3rd
4.	Respect for social norms	83 (30.7)	161 (59.6)	26 (9.6)	0.79	5th
5.	Cultural values	86 (31.9)	150 (55.6)	34 (12.6)	0.81	4th

Source: Field survey, 2017

5.8 Perceived health status of the respondents

Table 5.12 reveals the self-reported health status of the rural households. With reference to the physical functioning component of health status, concentration on doing something for at least 10minutes ($\bar{x}$ =2.77), using of hands and fingers ($\bar{x}$ =2.76) and remembering to do important things ($\bar{x}$ =2.75) were most prominent as activities that portrayed the health status of the respondents. However, lifting of heavy objects ($\bar{x}$ =2.06), climbing stairs ($\bar{x}$ =2.27) and reading a book or newspaper ($\bar{x}$ =2.28) were least prominent as activities that portrayed the health status of the rural households under the physical functioning domain.

This depicts that rural households are healthy physically and therefore would be able to carry out their daily activities to the best of their capabilities and even be productive in their work related activities. This assertion is in line with the thought of Bram, Rogier and Peep (2017) who assert that ability to carry out daily activities without limitation or dependence on others has been found to be a powerful determinant of self-perceived health.

With respect to social functioning domain, Table 5.12 shows that getting along with people ($\bar{x}$ =2.56) acting affectionately towards others ($\bar{x}$ =2.54) were most prominent as activities that portrayed the health status of rural households. However, acting irritable towards people ($\bar{x}$ =0.93) and isolating from people ($\bar{x}$ =1.39) were least prominent activities that depict the health status of the respondents under the social functioning domain.

This implies that rural households demonstrate adequate level of social functioning. With this findings, one can posit that rural households are socially healthy persons, and therefore would be able to function to the best of their capabilities and to the satisfaction of those around them. This assertion is in consonant with WHO (2016), who assert that socially healthy person is one who has found a comfortable niche in which to operate to his best capabilities and to the satisfaction of those around him.

With respect to mental functioning, Table 5.12 also reveals that being a happy person ($\bar{x}$ =2.41) and being calm and peaceful ($\bar{x}$ =2.30) were most prominent as activities that depict the health status of the rural households. However, being a nervous person ($\bar{x}$ =0.91) and

being so down with nothing to cheer up ($\bar{x}$ =0.79) were least prominent as activities that portrayed the health status of rural households under the mental functioning domain.

This implies that mental health of rural household is good. This may be due to the fact that life is more peaceful and less stressful in the rural areas when compared to urban areas. Moreover, it shows that with good mental health, rural households will be able work productively and contribute positively to the development of their communities. This result is in agreement with the findings of Regis *et al.* (2018), who found rural women reporting not having any anxiety or depression problems.

Table 5.11 Distribution of the respondents based on their perceived health status

	Dimension	Item	Did not do because of my health F (%)	Did with much difficulty F(%)	Did with some difficulty F(%)	Usually did with no difficulty F(%)	Rank
Physical Functioning	Activities of daily living	How difficult do you find carrying out these activities					
		Bathing	5(1.9)	8(3.0)	44(16.3)	213(78.9)	2.72
		Dressing	10(3.7)	15(5.6)	16(5.9)	229(84.8)	2.72
		Cooking	42(15.6)	4(1.5)	19(7.0)	205(75.9)	2.43
	Mobility & Dexterity	Lifting heavy objects / groceries	12(4.4)	57(21.1)	104(38.5)	97(35.9)	2.06
		Carry out moderate activities in the home	9(3.3)	21(7.8)	43(15.9)	197(73.0)	2.59
		Using your hands and fingers	9(3.3)	10(3.7)	17(6.3)	234(86.7)	2.76
		Walking more than one kilometer	15(5.6)	12(4.4)	62(23.0)	181(67.0)	2.51
		Bending, kneeling or stooping	8(3.0)	13(4.8)	56(20.7)	193(71.5)	2.61
		Climbing several flights of stairs	22(8.1)	39(14.4)	53(19.6)	156(57.8)	2.27
		Moving out of a chair or bed	8(3.0)	16(5.9)	42(15.6)	204(75.6)	2.64
		Using transport	16(5.9)	19(7.0)	69(25.6)	166(61.5)	2.43
	Vision	Seeing and recognizing across a long distance	18(6.7)	12(4.4)	54(20.0)	186(68.9)	2.51
		Seeing and recognizing a person across a short distance	4(1.5)	7(2.6)	34(12.6)	225(83.3)	2.78
		Reading a book or newspaper	22(8.1)	27(10.0)	75(27.8)	146(54.1)	2.28
	Hearing	Hearing a conversation with a person	7(2.6)	17(6.3)	36(13.3)	210(77.8)	2.66
		Hearing someone talking on the other side	4(1.5)	22(8.1)	40(14.8)	204(75.6)	2.64
		Hearing a group of conversation with at least 3 people	8(3.0)	21(7.8)	35(13.0)	206(76.3)	2.63
	Sleep	Falling asleep	6(2.2)	21(7.8)	24(8.9)	219(81.1)	2.69
		Waking up with ease	7(2.6)	15(5.6)	30(11.1)	218(80.7)	2.70
	Cognition	Concentrating on doing something for at least 10mins	2(0.7)	12(4.4)	33(12.2)	223(86.6)	2.77
		Remembering to do important things	7(2.6)	4(1.5)	38(14.1)	221(81.9)	2.75
		Analyzing and solving problems in day to day activities	4(1.5)	12(4.4)	52(19.3)	202(74.8)	2.67
		Learning a new task	9(3.3)	13(4.8)	61(22.6)	187(69.3)	2.58
	Communication	Understanding what people say	9(3.3)	6(2.2)	38(14.1)	217(80.4)	2.71

		Starting and maintaining a conversation	8(3.0)	11(4.1)	41(15.2)	210(77.8)	2.68
		Speaking clearly	4(1.5)	10(3.7)	40(14.8)	216(80.0)	2.73
	Self-care	Grooming	10(3.7)	22(8.1)	51(18.9)	187(69.3)	2.54
		Eating	11(4.1)	9(3.3)	21(7.8)	229(84.8)	2.73
		Using the toilet	9(3.3)	11(4.1)	34(12.6)	216(80.0)	2.69
Social functioning	Social role and social interaction	How often do you	Not do at all	Sometimes	Most times	All the time	
		Do as much as others in the same job	17(6.3)	47(17.4)	93(34.4)	113(41.9)	2.12
		I do well as others in the same job	5(1.9)	40(14.8)	101(37.4)	124(45.9)	2.27
		Work for your regular number of hours	10(3.7)	28(10.4)	78(28.9)	154(57.0)	2.39
		Work for short period of time or take frequently	59(21.9)	83(30.7)	76(28.1)	52(19.3)	1.55
		Work at usual job with some difficulty	54(20.0)	88(32.6)	69(25.6)	59(21.9)	1.51
		Get along with people who are close to you	10(3.7)	10(3.7)	68(25.2)	182(67.4)	2.56
		Isolate yourself from people around you	82(30.4)	38(14.1)	55(20.4)	95(35.2)	1.39
		Act affectionately towards others and maintained friendship	6(2.2)	23(8.5)	61(22.6)	180(66.7)	2.54
		Act irritable towards people around you	38(14.1)	27(10.0)	84(31.1)	121(44.8)	0.93
		Participate in community volunteer activities	3(1.1)	35(13.0)	71(26.3)	161(59.6)	2.44
		Find each day interesting and challenging	7(2.6)	16(5.9)	92(34.1)	155(57.4)	2.46
		Accomplish less than you would like	90(33.3)	57(21.1)	105(38.9)	18(6.7)	1.81
Mental functioning		Being a nervous person	23(8.5)	29(10.7)	121(44.8)	97(35.9)	0.91
		So down that nothing can cheer you up	20(7.4)	36(13.3)	82(30.4)	132(48.9)	0.49
		Calm and peaceful	12(4.4)	11(4.1)	129(47.8)	118(43.7)	2.30
		Being a happy person	9(3.3)	21(7.8)	91(33.7)	149(55.2)	2.41

Source: Field survey, 2017.

5.8.1 Categorisation of respondents according to their perceived health status

Table 5.13 shows the categorisation of respondents based on their health status. Majority (65.2%) of the respondents reported having good health status, while 34.8% of the respondents reported poor health status. This implies that the general health status of rural households is good since more than half of the respondents reported positive health in the three dimensions of health. This could be as a result of many factors that generally determines the health of an individual as earlier stated where health status is a complex function of physical, social and mental functioning of the individual. It is acknowledged that the natural environment of the rural populace affords them close relationship with nature as fresh and wholesome foods are available. Also one can link the health status of the respondents to the serene environment in the rural area which is free of solid, liquid and gaseous pollutants as found in the urban area thereby leading to improved health status. According to Lutoniski *et al*. (2017), the health of an individual is strongly influenced by genetic make-up, nutritional status, access to health care, socio-economic status, relationship with family members and participation in community life, personal habits and lifestyle choices. In addition, the environment - natural climatic, physical, social or work place, also play a major role in determining the health of people (Lutoniski *et al*, 2017). This result is in agreement with the findings of Regis et al. (2018), who found that rural women had better health related quality of life than urban women.

Table 5.12 Categorization of respondents according to their perceived health status

Health Status	Frequency	Percentage	Minimum	Maximum	Mean	SD
Good	176	65.2	34	13.24	9.000	2.39
Poor	94	34.8				

Source: Field Survey, 2017.

5.9 Hypotheses of the study

Hypothesis one

There is no significant relationship between selected socio-economic characteristics of the respondents and their food safety practices.

Data in Table 5.14 reveals that there were significant relationship between the respondents educational attainment (χ^2 = 78.842, p 0.000), marital status (χ^2 = 7.942, p 0.047), religion (χ^2 = 19.663, p 0.000) years of formal education (r = 0.489, p = 0.000) and food safety practices.

The relationship between the respondents' educational attainment and food safety practices imply that with increase in the level of education of the respondents there will be increase in their food safety practices. Suffice to say that with increase in respondents' educational attainment, they would have had more exposure to the benefits attached to food safety practices, and the role food safety practices will play with respect to enhancing their health status. Hence with increase in educational attainment the respondents are better inclined towards food safety practices. Ali Al Sakkaf (2013), considered level of education as the most important factor in determining public understanding of food safety practices. Similarly, Ogbenekohwo (2015) asserts that literacy determines the participation of people in self and family health promotion.

The significant relationship between the respondents' marital status and food safety practices implies that married respondents are favourably disposed to food safety practices than other set of respondents. This suggests that because married respondents are more likely to prepare meals for their spouses and children at home, there is an increase likelihood that they will adhere to food safety practices in order to safeguard the health of their family members. Moreover, probably because they had experience the consequences of consuming contaminated food in the past. This view is in line with Safefood (2014) that observed that married women (mothers) were inclined to take food safety practices more seriously than unmarried younger women. Furthermore, married women are more careful to observe food safety practices than single women, and that having children and spouses may

necessitate an orderly approach to kitchen tasks to ensure save food for promoting their family health status.

The significant relationship between religion and food safety practices further emphasize that respondents religion play a significant role in ensuring food safety practice. This is likely because both religions (Christianity and Islam) emphasize general cleanliness and place particular emphasis on ensuring that its followers conform to food safety practices. It is also noted that both religions (Christianity and Islam) acknowledge the role of hygiene in food preparation and in the environment.

Table 5.14 also revealed that there was significant relationship between respondents' years of formal education and food safety practices. This depict that the higher the level of education acquired by the respondents the more it will reflect positively on their food safety practices. The implication of this is that the more years spent in formal education, the more likely they will be exposed to information on food safety practices. Therefore, they are in a vantage position to appreciate the benefits attached to food safety practices for safe-guarding the health of their household members. Moreover, they are more likely to defy the odds associated with observing food safety practices. This view is in line with Oghenekhwo (2015) that years of formal schooling/literacy level has impact on the health status of individuals. This is because lack of knowledge, skills and awareness about food safety and the health hazard associated with consumption of unsafe food can negatively impact public health. Similarly, IFPRI (2009) asserts that healthiness is positively associated with years of schooling, highly educated people are more likely to engage in health promoting lifestyle.

Table 5.13: Chi-square distribution of the relationship between respondents' personal characteristics and food safety practices.

Variable	Df	χ^2 value	p-value	Decision
Sex	1	2.28	0.147	NS
Level of education	4	78.84	0.000	S
Marital status	3	7.94	0.047	S
Religion	3	19.66	0.000	S

S = Significant, NS =Not significant

Source: Field Survey, 2017

Result on Table 5.15 shows that there was no significant relationship between age (r=-0.024, p=0.572), household size (r= -0.101, p= 0.104)), duration of marriage (r= -0.026, p= 0.674)), average monthly income (r= 0.324, p= 0.104) and respondents food safety practices. Thus the null hypothesis is accepted. This implies that these factors may not likely influence the food safety practices of the respondents.

Table 5.14 PPMC distribution of the relationship between the selected personal characteristics of the respondents' and food safety practices

Variable	r- value	p-value	Decision
Age	-.0.024	0.572	NS
Household size	-0.101	0.104	NS
Duration of marriage	-0.026	0.674	NS
Average monthly income	0.324	0.104	NS

S=Significant, NS=Not Significant

Source: Field Survey, 2017

Hypothesis two

There is no significant relationship between respondents' knowledge of food safety and health status.

Statistics as revealed in Table 5.16 depict that there was significant relationship ($r = 0.523$, $p = 0.000$), between the respondents food safety knowledge and their health status. Thus depicting that as respondents' knowledge on food safety increases, their health status is enhanced. It is noted that as a result of the increase in their knowledge base of food safety practices, they will better appreciate and put to use the activities revolving around food safety practices which will eventually translate to improve health status. Moreover, breaches of proper food safety behaviour will be averted as respondents are knowledgeable about the negative consequences of eating unsafe food which can negatively impact on their health and that of their household members.

This view is in line with Unusan (2007) and Jevsnik *et al.* (2008) who indicated that the food safety knowledge of food handlers at the consumers' level is crucial for food safety control. Similarly, Nesamvuni (2014), asserts that improving food safety knowledge can have positive impact on food safety practices but cannot be the sole solution for improving food safety behaviour. Thus it becomes imperative to boost the knowledge base of food handlers at household level on food safety measures and the possible hazards that can result from eating unsafe food in order to promote the health status of rural households.

Table 5.15 Correlation analysis between respondents' knowledge of food safety and Health status

Variable	r-value	p-value	Decision
Knowledge	0.523	0.000	S

Source: Field Survey, 2017.

Hypothesis three

There is no significant relationship between respondents' attitude to food safety and their health status

Correlation analysis between attitude to food safety and health status is revealed in Table 5.17. It shows that there was significant relationship (r = 0.178, p =0. 003) between respondents attitudes to food safety and their health status. This depicts that the more favourably disposed to food safety, the more their health status is enhanced. With the positive and significant relationship, it is suffice to say that respondents will be able to accomplish the actions that have to do with food safety and as this is being done their health status is enhanced. It is plausible to state that they were favourably disposed to food safety as a result of the educational exposure they have had over time, thus they appreciate the role played by food safety practices which shaped their attitude towards it. It establishes further the fact that with modification of attitude towards food safety practices there is observed manifestation of their change in attitude on their health status. Furthermore one can submit that meaningful transformation of the health status of the respondents is a direct consequence of the modification of their attitude towards food safety. This is in line with the view of Samapando *et al*. (2015), who observed that majority of the consumers who have favourable attitude to food safety are those that practice food safety. In line with this realisation, WHO (2015) recommend that greater efforts should be geared towards educating consumers especially at household level on food safety risk. This will instill positive attitude towards food safety which can lead to better food safety practices for better health. However, in addition to education intervention, Bamidele *et al.* (2016) pointed out that lack of basic hygiene infrastructure and sanitary facilities such as water, soap, and toilets, lack of storage facilities, all contributed in no small measure to poor attitudes toward hygiene practices among food handlers. Therefore any intervention programme on food safety that will have positive outcome, must be accompanied with provision of necessary facilities that will aid food safety practices especially at household level. It is then that the rate of foodborne illness will be stepped down and households will enjoy better health.

Table 5.16 Correlation analysis between attitude and health status

Variable	r-value	p-value	Decision
Attitude	0.178	0.003	S

Source: Field Survey, 2017.

Hypothesis four

There is no significant relationship between food safety practices and health status of the respondents.

Table 5.18 revealed that there was significant relationship (r = 0.386, p 0.000) between food safety practices of the respondents and their health status. The positive and significant relationship portrays that with increase undertaking of food safety practices by the respondents their health status is enhanced. It is plausible to state that the component activities revolving around food safety practices are such that will prevent contaminants and contamination, and ensure that the food preparation process is under strict hygiene. Hence, having all these in place will translate to an improvement in the health status of the households. Bamidele *et al.* (2016), assert that mishandling and disregard for hygiene measures on the part of food handlers are responsible for food contamination and its attendant consequences which includes food poisoning and spread of diseases with resultant morbidity and occasionally death.

Similarly, Eghenekohwo (2015) and Lingioino *et al*. (2012) found that most families lack correct adherence to food safety practices. Common food handling mistakes include; serving contaminated food, inadequate cooking or reheat of food, consumption of food from unsafe sources, cooking inappropriately, contamination of food by pathogens from utensils and use of water with high levels of pathogens. Suffice to say that food handlers play a paramount role in ensuring food safety and prevention of food related illnesses that may emanate from eating unsafe food because of non/low adherence to food safety practices. In Nigeria many rural areas and sub-urban regions lack essential amenities and adequate enlightenment or sensitisation on the importance of food safety for safeguarding health (WHO, 2015). Thus it is important that food handlers be educated on good hygiene practices and health behaviour with respect to food safety (Fosoro *et al*., 2016). Moreover, consumption of unsafe food is a serious threat to public health in Nigeria for the last couple of decades, and this can be a significant reason of many chronic and non-chronic diseases including diarrhea, cancer, heart diseases, various kidney diseases and birth defects (Ifenkwe, 2012). Therefore, government need to take pragmatic steps to combat these

health problems by educating and sensitizing the citizen on the health benefits of practicing food safety.

Table 5.17 Correlation analysis between food safety practices and health status

Variable	r-value	p-value	Decision
Food safety practice	0.386	0.000	S

Source: Field Survey, 2017.

Hypothesis five

There is no significant relationship between constraints to food safety practices and health status of the respondents

Result on Table 5.19 reveals that there was no significant relationship ($r = 0.033$, $p = 0.589$) between constraints to food safety practices and health status. This portrays that the health status of the respondents is not determined by the constraints to food safety practices. This insignificant relationship may be due to the fact that respondents do not consider food safety issues as something that has to do with their health. Moreover, some food handlers consider foodborne disease as a matter of bad luck or spiritual attack and not something under their control (Young and Waddell, 2015).

Table 5.18 Correlation analysis between constraints to food safety practices and health status of the respondents

Variable	r-value	p-value	Decision
Constraints	0.033	0.589	NS

Source: Field Survey, 2017.

Correlation analysis of disaggregated items of constraints to food safety practices and respondents health status

Table 5.20 revealed that social norms was significantly related to health status. This implies that social norms had influence on the health status of the respondents. This suggests that the respondents in their attempt to comply with social norms do engage in harmful behaviour that can affect their health negatively. Table 5.20 further revealed a negative correlation, meaning that the less the respondents' allow social norms to influence their food safety practices the more their health is enhanced. This results agree with Beniamino and Lori (2018) assertion that the influence of social norms on several health related practices including food intake and handwashing may be harmful to one's health.

Therefore, any intervention to improve people's health status should centre on changing people's behaviour and social norms that sustains harmful practices.

Table 5:19 Correlation analysis of constraints items to food safety practices and the respondents' health status

			Health Status index
Spearman's rho	Health Status index	Correlation coefficient Sig (2-tailed) N	1.000 270
	Inadequate finance	Correlation coefficient Sig (2-tailed) N	.150* .064 270
	Lack of infrastructure	Correlation coefficient Sig (2-tailed) N	.087 .154 270
	Cumbersome nature of food safety practices	Correlation coefficient Sig (2-tailed) N	-.003 .967 270
	Social norms	Correlation coefficient Sig (2-tailed) N	-.148* .015 270
	Cultural values	Correlation coefficient Sig (2-tailed) N	-.116 .056 270

Source: Field Survey, 2017

Hypothesis Six

There is no significant contribution of food safety knowledge, attitude and practices (KAP) to frequency of foodborne illnesses experienced by the rural households

Regression analysis of the contribution of food safety knowledge, attitude and practices (KAP) is shown on Table 5.20 It shows that knowledge on food safety (β = -0.591, p = 0.000) and food safety practices (β = -0.161, p = 0.021) were determinants of frequency of foodborne illnesses experienced, while attitude to food safety (β = -0.281, p = 0.602) was not significant and therefore does not contribute to the frequency of foodborne illness experienced. The contribution of knowledge on food safety and food safety practices to the frequency of foodborne illness experienced accounted for by 32%.

The negative but significant contribution of knowledge on food safety to the frequency of foodborne illnesses experienced depict that with an increase in the knowledge of food safety, they are able to take precautionary measures during purchase and storage of food items, personal hygiene during cooking and food preparation, and against cross contamination of food, which are predisposal factors to the foodborne illnesses they are likely to experience. This result is in tandem with Sonika and Jasvinder (2015), who found that with increase in knowledge of food safety practices there is decrease in the disease incidence associated with food.

Also, food safety practices is a contributor to the frequency of the food-borne illnesses experienced. The negative contribution depicts that with increase in their food safety practices, there would be reduction in the frequency of foodborne illnesses experienced. It is noted that as respondents take precautionary measures in food safety practices the rate of experiencing foodborne illnesses will reduce. These precautionary measures according to Abuga *et al*. (2017) are: thorough cooking of food, avoiding cross-contamination of food by washing hands, utensils and cutting boards, chilling or refrigeration of leftover foods and washing food and hand regularly.

Moreover, Roopa *et al*. (2016), assert that food production, handling and preparation techniques all have direct influence on health, hence it is pertinent to observe food safety practices at consumer end of the food chain to avoid foodborne illness which is a global health issue in this decade.

Table 5.20 Contribution of food safety knowledge, attitude and practices (KAP) to the frequency of food borne illnesses experienced by the respondents

Variables	Standardized β	T	P	Decision
Knowledge	-0.591	-8.677	0.000	S
Attitude	0.281	5.428	0.602	NS
Practices	-0.161	-2.232	0.021	S
	R^2= 32%			

Source: Field Survey, 2017.

Hypothesis seven

There is no significant contribution of food safety behaviour (knowledge, attitude and practices) of respondents to their health status.

Statistics as shown on Table 5.21 depict that respondents knowledge on food safety (β = -0.323, p = 0.001), attitude to food safety (β = -0.180, p = 0.001) and food safety practices (β = -0.1001, p = 0.015) were all contributors to the health status of rural households. With an R^2 of 40% depicting that those variables explain health status of rural households to this magnitude.

The significance of knowledge on food safety is hinged on the fact that as the households were exposed to the issues and undertakings relating to food safety they are in a vantage position to take precautionary measures necessary to ensure that their food is safe, the environment where the household meals are prepared are safe and other activities revolving around food and food preparation for the household is safe. All these will culminate into the households consuming safe and wholesome food which in turn promotes their health status. There is therefore the need to boost food safety knowledge of rural households, activate their existing knowledge and motivate information application (Byrd-Bredbenner *et al*, 2013).

The role of attitude to food safety as a contributor is premised on the fact that with positive attitude to food safety, long held perception and traditional positions held by the respondents in relation to food safety is being modified. Thus, activities revolving around food safety is placed as a priority which eventually contributes to improve health status of rural households. This view is in line with the position of Motta *et al* (2014), that deep rooted beliefs and habits developed over generations do prevent some family members from having favourable attitude towards food safety practices for the promotion of health. Hence, food safety education and health hazards information is needed to develop positive attitude to health related behaviour.

The importance of food safety practices as a contributor to the health status of rural households is premised on the notion that as respondents take into account food safety activities relating to purchase and storage of food, personal hygiene in food preparation and

cooking, avoiding cross contamination of food etc. there is commensurate reflection of these on the health status of the households. These practices will prevent them from being predisposed to food-borne illnesses which will influence their health status negatively. It is worthy to state that, with food safety practices contributing to the health status of the respondents, the knowledge on food safety acquired, and the modification of their attitude positively towards food safety, a positive transformation has reflected in food safety practices adopted, which in turn contributed to their health status. In line with the above view Motta *et al*. (2014), assert that consumer is primarily responsible for the consequences of their health if some preventive measures and safe food handling practices are not observed before consumption. Moreover, the safety of food at the moment of consumption is critical for human health, and depends on many variables which may include: criteria for checking the safety of food ingredients when choosing and purchasing food, food transportation, the storage and preservation of food, food preparation and cooking, the exposure of food to a dangerous temperature, the handling of left overs, kitchen facilities and the use of kitchen appliances, personal hygiene and the basic health care of the food handlers (Motta *et al*., 2014).

Table 5.21 Contribution of knowledge, attitude and food safety practices (KAP) of respondents to health status

Variables	Standardized β	T	P	Decision
Knowledge	0.325	4.050	0.001	S
Attitude	0.180	3.597	0.001	S
Practices	0.107	1.371	0.015	S
	R^2= 40%			

Source: Field Survey, 2017.

Hypothesis eight

There is no significant relationship between food safety behaviour of the respondents and health status

Table 5.22 reveals that there was significant relationship (r = 0.330, p= 0.000) between food safety behavior and health status of rural households. This depict that the overall modification in the behaviour of the respondents towards food safety did translate to an improvement in their health status. Moreover, the knowledge acquired on food safety, the modification of their attitude towards food safety, and their ability to adopt practices related to food safety, there was a consequence of all these on their health status. This perfect relationship also implies that as respondents demonstrate appropriate food safety behavior (in relation to purchase and storage, personal hygiene, cooking and food preparation and cross-contamination) they are indirectly promoting their health status. Suffice to say that as respondents take appropriate actions as regards food safety, this will have a far reaching impact on their health positively. Appropriate food safety behaviour to risk prevention in food preparation and consumption lead to an improvement in health status. Conversely, health damaging behaviour leads to poor health status. This thought is in line with Laxmi (2016), who asserts that consumer food safety behaviour is essential and crucial for health promotional activities.

Table 5.22 Correlation analysis between food safety behavior of the respondents and their health status

Variable		r-value	p-value
Decision			
Food safety behaviour	0.330	0.000	S

Source: Field survey, 2017

Hypothesis nine

There is no significant difference in the food safety behaviour of the respondents across the states

The study tested the hypothesis for significant difference in the food safety behaviour of the respondents across the states. Table 5.23 shows there was a significant difference (F= 5.709, P= 0.004) in the food safety behaviour of the respondents across the states. The variance in the food safety behavior across the states may be attributed to the differences in the respondents' knowledge of food safety, attitude to food safety and their food safety practices across the states. This also depict that the level of exposure of the respondents to the components of food safety behaviour differ from state to state. This line of thought is in line with the finding of Al Shakkaf (2015), who found a positive association between knowledge of food safety and food safety behaviour.

Table 5.23 Test of difference in the food safety behaviour of the respondents across the states

Variable	Sum of Squares	DF	Mean square	F	Sig
Between groups	54.010	2	27.005	5.709	0.004
Within groups	1262.924	267	4.730		
Total	1316.934	269			

Source: Field survey, 2017

Post hoc analysis of food safety behaviour of respondents across the states

The post hoc test as shown in Table 5.24 reveals the separation of means of food safety behaviour across the states. It is revealed that Oyo state had appropriate food safety behaviour (6.94) than Ogun (6.39) and Ekiti (5.77) states. With this data, it shows that the food safety behaviour of the respondents differ across the states. This could be attributed to the differences in their personal characteristics and their level of exposure to the components of food safety behaviour. Hence, on can affirm that appropriate food safety behaviour is lowest in Ekiti State compared to Ogun and Oyo States.

Table 5.24 Post Hoc analysis of food safety behaviour of respondents across the states

States	N	Subset for alpha = 0.05		
		1	2	3
Ekiti	60	5.79		
Ogun	90		6.39	
Oyo	120			6.94
Sig		1.000	1.000	1.000

Source: Field Survey, 2017.

Hypothesis ten

There is no significant difference in the health status of the respondents across the states

The study tested the hypothesis for significant difference in the health status of the respondents across the States. Table 5.25 shows that a significant difference exist (F= 28.329, P= 0.000) in the health status of the respondents across the states. The variance in the health status across the states may be attributed to the difference in the degree of health related contributory factors that the respondents are exposed to. The contributory factors according to Webb et al, (2018) are level of access to health care services, economic and social conditions of people, as well as their physical and mental conditions.

Table: 5.25 Test of difference in the health status of the respondents across the states

Variable	Sum of Squares	DF	Mean square	F	Sig
Between groups	268.219	2	134.110	28.329	0.000
Within groups	1263.982	267	4.734		
Total	1532.201	269			

Source: Field survey, 2017

Post hoc analysis of health status of respondents across the states

The post hoc test as shown in Table 5.26 reveals the separation of means of the health status of the respondents across the states. It is revealed that respondents in Ogun state had good health status (9.84), compared to Oyo (9.27) and Ekiti (7.19) states. With this data, it shows that the health status of the respondents differ across the states. The variance in health status could be attributed to other predictors of health status such as socio-economic characteristics of the respondents and their access to health care services. This line of thought corroborate the findings of Bartholomew and D'Arcy (2018), who found that age, income, education and gender were positively associated with self- rated health.

Table 5.26 Post Hoc Analysis of Health Status of Respondents across the States

States	N	Subset for alpha = 0.05		
		1	2	3
Ekiti	60	7.19		
Oyo	120		9.27	
Ogun	90			9.84
Sig		1.000	1.000	1.000

Source: Field Survey, 2017.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Summary

Food safety concerns are increasing all over the world. Foodborne illnesses represent a major and daily health threat in all countries. The current heightened attention food safety is receiving shows that long lasting food safety challenges have not yet been resolved. Food handlers in the food premises are responsible for food safety throughout the chain of production, processing, storage and food preparation. Food safety behaviour of food handlers especially at the household level is very critical for the prevention of foodborne illnesses, more so that the homes have been implicated for mishandling of food more than commercial food preparation outlets. Therefore, this study ascertained the contributions of food safety behaviour to health status of rural households in southwestern Nigeria.

This study was carried out among rural households in southwestern Nigeria. Multi-stage sampling procedure was used to select respondents. The first stage involved the selection of 50% from six states that make up the Southwestern Nigeria. Thus, Oyo, Ogun and Ekiti states were selected. The second stage involved isolation of rural LGAs from the selected states. Oyo has 21 rural LGAs, while Ogun and Ekiti states have 16 and 12 rural LGAs respectively. Third stage involved selection of 20% of LGAs from the isolated rural LGAs in stage two. This produced 4, 3 and 2 rural LGAs from Oyo, Ogun and Ekiti states respectively. The fourth stage involved random selection of 10% of the wards from the rural LGAs selected in stage three. This gave rise to 8, 6, and 4 wards for Oyo, Ogun and Ekiti states respectively. The fifth and final stage involved random sampling of 5% rural households in the selected wards in stage four. This produced 120, 90 and 60 respondents (i.e. those in charge of food preparation in the households) from Oyo, Ogun and Ekiti states respectively. In all a total of 270 rural households were sampled.

Quantitative data on socio-economic characteristics, sources of information on food safety, knowledge OF food safety, attitude to food safety, food safety practices, constraints to food safety practices, food-borne illnesses experienced, frequency of food-borne illnesses

experienced, health care utilization and self-reported health status were collected from the households' food handlers.

Qualitative data from Focus Group Discussion (FGD) was used for complementary purpose. Quantitative data were presented using tables, percentages, frequency and mean, while hypotheses were tested using chi-square, PPMC and multiple linear regression. Findings from the study reveal that the overall mean age of the respondents was 43 ± 11.9, 75.6% were females while 24.4% were males and 82.25 were married. Mean year of marital and formal education were 16.5 ± 13.1 years, 8.5 ± 6.3 years respectively while nearly half (47.4%) of the respondents were engaged in farming. Respondents were mostly Christians (64.1%) while 30.7% were Muslims. The mean household size and monthly income were 4.8±1.8 persons, ₦33,300 ± 12,300 respectively, and 58.5% belong to religious organizations, while 8.1% and 4.1 % belonged to political and cultural organizations respectively. Food safety information was mostly accessed through family and friends ($\bar{x}$ = 1.62), neighbours ($\bar{x}$ = 1.44), and health workers ($\bar{x}$ = 1.40). The study further reveals that 63.7% of the respondents had high knowledge of food safety, while 36.3% had low level knowledge of food safety. Less than half (41.1%) had favorable attitude to food safety, while 58.9% had unfavorable attitude to food safety, and 61.9% had high level of food safety practices while 38.1% had low level of food safety practices. Moreover, 56.3% of the respondents had appropriate food safety behaviour while 43.7% had inappropriate food safety behaviour. Constraints to food safety practices experienced by the respondents were lack of infrastructure ($\bar{x}$ = 1.26) and inadequate finance ($\bar{x}$ = 1.06). Fever chills (62.6%), abdominal cramping (50.4%), worm in stool (36.7%) and diarrhea (36.3%) were food-borne illnesses mostly experienced, while fever chills ($\bar{x}$ = 1.07), abdominal cramping ($\bar{x}$ = 0.92) and diarrhea ($\bar{x}$ = 0.79) were the food-borne illnesses frequently experienced by the rural households. Health care mostly used by the rural households were self-medication ($\bar{x}$ = 1.88 and patent medicine store/chemist ($\bar{x}$ = 1.37).

About two-third (65.2%) of the respondents reported having good health status while 34.8% reported having poor health status. Overall, the socio-economic characteristics that were significantly related to food safety practices were educational attainment (χ^2=78.842, p=

0.000), marital status (χ^2 =7.942, p =0.047), religion (χ^2 =19.663, p= 0.000) and years of formal education (r= 0.489, p= 0.000).

Significant relationship existed between knowledge of food safety (r= 0.523, p= 0.000), attitude to food safety (r= 0.178, p= 0.003), food safety practices (r=0.330, p=0.000) and health status.

The study also revealed that food safety knowledge and food safety practices were contributors to the frequency of foodborne illnesses experienced by the rural households (β= -0.591, p= 0.000) and (β= -0.161, p= 0.021) respectively. The overall contribution of these variables was 32%.The study also revealed that food safety behaviour (knowledge, attitude and practices (KAP), were contributors to health status of rural households: knowledge of food safety (K) (β= -0.323, P= 0.001) attitude to food safety (A) (β= -0.180, P= 0.001) and food safety practices (P) (β= -0.1001, p= 0.015). These variables explain health status of rural households by 40% (R^2= 40%). The result of analysis of variance shows a significant difference in the food safety behaviour of the respondents across the states (F=5.709, p= 0.004). The post hoc analysis further revealed that Oyo state had appropriate food safety behaviour (6.94), than Ogun (6.39) and Ekiti (5.79) states. The ANOVA also reveals a significant difference in the health status of the respondents across the states (F=28 239, p= 0.000). Post hoc analysis further showed that Ogun state had good health status (9.84), than Oyo (9.27) and Ekiti (7.19) states.

6.2 Conclusion

Based on the findings from this study, it can be concluded that food safety behaviour (knowledge, attitude and practice) of the respondents contributed positively to their health status. Respondents were in their middle age, majority were female and married and they were averagely educated. Food safety information was mostly sourced from family and friends. Respondents had high level of food safety knowledge and practices but were unfavourably disposed to food safety. Constraint to food safety practices were lack of infrastructure and inadequate finance. Fever chills, abdominal cramping and diarrhoea are food-borne illnesses mostly experienced by the rural households.

Respondents' food safety behaviour and their health status deferred across the States. Oyo State had appropriate food safety behaviour than Ogun and Ekiti States, while Ogun State had good health status than Oyo and Ekiti States.

6.3 Recommendations

Based on the conclusion, the following recommendations are proffered for appropriate food safety behavior of households in southwestern Nigeria.

1. Food safety education should be given to rural household, based on the context of their local circumstances. The education material should cover areas of personal hygiene, environmental sanitation, cross-contamination, good cooking habit to avoid foodborne illnesses. WHO five keys to food safety can be modified to suit local context. Government and NGOs could be of help in this area.
2. The study revealed that majority of household food handlers' source food safety information from family and friends, there is the tendency of passing wrong information to them which may negatively affect their health. Therefore health workers should be equipped to provide food safety information/education to rural households.
3. Provision of infrastructural facilities (pipe borne water, waste disposal facilities) by government, NGOs and community efforts to motivate and encourage rural household food handlers to practice food safety.
4. The result from this study show that majority of the respondents had unfavourable attitude to food safety, therefore sensitization programmes on available media should be launched in rural areas by relevant stakeholders to raise awareness on importance of appropriate food safety behaviour.
5. Based on the disparity in food safety behaviour across the states, there is the need for information sharing and comparing of notes on food safety behaviour by relevant stakeholders across the states.

6.4 Contributions to knowledge

1. The preferred sources of information on food safety of rural households in southwestern Nigeria were established.
2. Food safety behaviour of rural households (knowledge, attitude and practice) was established.
3. The need to instil favourable attitude to food safety among rural households was established.
4. Food-borne illnesses mostly experienced by rural households were brought to the fore.
5. Health care service utilised by rural household was established
6. Health status of rural household was established.

Area of further research

1. As a result of the importance of appropriate food safety behaviour to health status, studies can be carried out to explore the determinants of appropriate food safety behaviour at the household level in the country. Findings from such studies can be used by health agencies to design appropriate food safety regulations based on the local context.
2. An intervention study that will reveal the resources needed for appropriate food safety behaviour at the household level can be conducted. Findings and recommendation from such study will be useful to policy makers while designing food safety programmes for households.
3. The study only covered southwestern Nigeria, therefore similar studies can be conducted in other parts of the country in order to know the current situation and to develop appropriate policy for food safety regulation at the household level.

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APPENDICES

APPENDIX 1

UNIVERSITY OF IBADAN

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT

INTERVEW SCHEDULE

ON

CONTRIBUTION OF FOOD SAFETY BEHAVIOUR TO HEALTH STATUS OF RURAL DWELLERS IN SOUTHWESTERN NIGERIA

Dear Respondent,

I am a PhD research student in the department of Agriculture and Rural Development, University of Ibadan, Ibadan, Nigeria. I am conducting a study on the Contributions of Food Safety Behaviour to Health Status of Rural Households in Southwestern Nigeria. Health problems resulting from risky food safety behaviour of rural households is the major focus of this study. Please respond freely to questions on knowledge, attitude and food safety practices. Your participation is voluntary and all information supplied will be treated as confidential and used for research purpose only. The outcome of this research will help relevant stakeholders in health sector to develop appropriate strategies to mitigate health problems that could arise from food and water handling in Nigeria.

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Section A

Sources of information on food safety practices:

Instruction: Bellow is the list of sources on information on food safety practices, please indicate the frequency of using the information sources from the options given.

Sources of Information	Always (2)	Occasionally	Not at all (0)

		(1)	
Friends and family			
Neighbours			
Radio			
Television			
Government agencies			
Newspaper			
Non-governmental organization			

SECTION B: KNOWLEDGE ON FOOD SAFETY.

Instruction: Bellow are statements meant to test your knowledge on food safety. You are to select one correct answer from the options provided.

Purchase and storage

1. What do you consider most important when purchasing food items (a) select food items that have low price (b) select tasty food items (c) select fresh and wholesome food
2. To make stored food safe for eating, it should be protected from (a) dust and chemicals (b) flies, rodents and pets (c) a and b
3. Raw meat should be stored (a) on top of cooked food (b) at the bottom of cooked food (c) in the same container with cooked food.
4. To avoid food contamination, leftover food should be eaten (a) within one day (b) within 2 days (c) within 3 days.
5. Food items that are damaged or rotten
   (a) can be purchased and used after washing it with clean water (b) can be purchased and used after washing it with soap (c) should not be purchased or used.

Personal hygiene

6. When preparing/cooking food it is safe to wash your hands thoroughly with soap and water
   (a) before handling food (b) after handling food (c) frequently before, during and after handling food.
7. How should food dishes be washed to make them safe for serving food. (a) by washing with soap and hot water (b) by washing with water only (c) by washing with soap and hot water and dry with dry clean towel.
8. Kitchen area should be protected from (a) insects and pests (b) domestic animals (c) a and b
9. In order not to contaminate your food, it is important to
   (a) wash your hands properly before eating (b) clean your hands with any towel
   (c) use your clothe to clean your hands.
10. To prevent transmission of pathogens to food, hands should be washed thoroughly after (a) using the toilet (b) handling rubbish (c) blowing your nose (d) a, b and c.
11. Where should you keep your dustbin? (a) inside the kitchen (b) outside the kitchen (c) in the passage.

Cooking and food preparation

12. Water from streams and wells are safe to drink (a) after pouring it into water pot (b) after boiling it (c) after pouring it into a bucket with cover.
13. Fresh fruits and vegetables are safe to eat (a) after washing it with soap (b) after washing it with clean water (c) without washing it.
14. How would you know if meat has been properly cooked and safe to eat (a) when it is burnt (b) when the meat has no blood or pink colour when you cut it into half (c) when it is soft
15. Leftover food is safe to eat (a) after you have thoroughly reheated it (b) without reheating it (c) a and b
16. Eating raw or undercooked food (a) can predispose you to food borne illness (b) is good for the body (c) serve as medicine to the body.
17. Why is it not safe to cook food when you are sick (a) you can be feeling sleepy (b) you can contaminate food (c) food can get burnt.

Cross contamination

18. Cross contamination of food can occur when (a) you put raw and cooked food together (b) you separate raw and cooked food (c) you separate cutting board/utensils for raw and cooked food.
19. Before using the plate used for raw food for cooked food (a) it must be washed with water only (b) it must be washed with soap and water. (c) It must be washed with hot water and soap.
20. When foods that are cross contaminated are eaten (a) it can result into good health (b) it can be good medicine to the body (c) it can cause food-borne illness.

SECTION C: FOOD SAFETY ATTITUDE

Instruction: Please select the option that best represents your attitude to food safety. The options are Strongly Agree (SA), Agree (A), Undecided (U) Disagree (D) and Strongly Disagree (SD).

S/N	Statement	SA	A	U	D	SD
1	Frequent hand washing during food preparation is a worthwhile practice if contamination will be prevented during food preparation					
2	Keeping kitchen surfaces clean is not likely to reduce the risk of food borne illnesses					
3	Separating raw and cooked food helps prevent food borne illnesses					
4	Using different knives for raw and cooked food might not prevent foodborne illnesses					
5	Cooking meat thoroughly can prevent foodborne illness					

6	Drinking well/stream water may not predispose one to food borne illnesses					
7	Fruits and vegetables should be kept in a cool place					
8	It is safe to leave cooked food for a long time before eating it					
9	Buying of fresh and wholesome food is very important					
10	Coughing and sneezing when cooking food can contaminated food					
11	It is safer to serve food when it is hot to prevent food contamination					
12	Leftovers can be eaten without thorough reheating					
13	Fruits and vegetables should be washed thoroughly several times with clean water to remove dirt and other contaminants					
14	It is not important to clean cooking utensils after use					
15	It is not necessary to cover food properly before storing it					
16	Old food products should be used up before new one					
17	Cross contamination of foods is likely to occur when you touch raw food and then touch cooked food.					

SECTION D: FOOD SAFETY PRACTICES

Instruction: Below are the food safety practices, please select the option that represents your food safety practices from the options provided.

S/N	Purchase And Storage	Always	Occasionally	Never
1.	Keeping of raw food from ready-to-eat foods while shopping			
2	Purchase fresh and wholesome food			
3	Protecting food from flies, pests and rodents			
4	Consumption of leftovers within one day			
5	Throwing away mouldy food			
	Personal hygiene			
6	Washing of hands with soap and water thoroughly during food preparation			
7	Washing of hands after handling rubbish or using the toilet			
8	Washing and cleaning up kitchen surfaces and utensils used for food preparation			
9	Boiling of water from well/stream before drinking			
10	Washing fresh fruits and vegetables with clean water before eating it			
11	Allowing pets to eat from utensils and dishes used for humans			
	Cooking and food preparation			
12	Washing of dishes with hot water and soap			
13	Cooking meat thoroughly with no pink colour or blood			
14	Reheating of leftover food thoroughly before eating			
15	Using clean and safe water for cooking			
16	Covering skin infections, cuts and grazes			

	when cooking			
17	Covering hair, scrub/cut nails clean before preparing food			
	Cross contamination			
18	Keeping raw food separate from cooked food			
19	Washing of plates used for raw food thoroughly with soap and water before using it for cooked food			

SECTION E: CONSTRAINTS TO FOOD SAFETY PRACTICES

Instruction: Please tick one of the options that shows the level of constraints to food safety practices you experience from the list of constraints to food safety practices provided bellow.

S/N	Constraints	Not a constraint	Minor constraint	Major constraint
1	Inadequate finance			
2	Lack of infrastructure			
3	Cumbersome nature of food safety practices			
4	Social norms			
5	Cultural values			

SECTION G: FREQUENCY OF FOODBORNE ILLNESS EXPERIENCED

Instruction: Please tick the option that shows how often your household experience foodborne illness in the last one year from the list of the foodborne illnesses provided.

Food borne disease	**Weekly**	**Fortnightly**	**Monthly**	**Once in 3 months**	**Once in 6 months**	**Not at all**
Diarrhoea						
Dysentery						
Nausea						
Vomiting						
Abdominal cramping/pain						
Blood in the stool						
Typhoid						
Cholera						
Jaundice						
Cancer						
Arthritis						
Neurological disorder						
Sore throat						
Fever chills						
Worms in stool						

SECTION H: HEALTH CARE UTILIZED

Instruction: Please tick one of the option that shows the type of health care utilized by your household from the list of health care services provided.

Health care utilized	**Always**	**Occasionally**	**Not at all**
Government hospital			
Private clinic			
Traditional practitioners/herbs			
Patent medicine store/chemist			
Self-care medication			

SECTION I: HEALTH STATUS

Instruction: Below are statements meant to ascertain your health status, please respond to each statement by selecting one of the option that depict your health status in the area of physical, social and mental functioning.

S/N	Domain	Dimension	Item	Usually do with no difficulty (3)	Do with some difficulty (2)	Do with much difficulty (1)	Do not do because of my health (0)
	Physical functioning						
		Activities of daily living	How difficult do you find carrying out these activities 1. Bathing				
			2. Dressing				
			3. Cooking				
		Mobility and dexterity	4. Lifting heavy groceries or objects				
			5. Carry out moderate activities such as moving a table, cleaning the home				
			6. Using your hands and fingers				
			7. Walking more than one kilometre				
			8. Bending, kneeling or stooping.				

			9. Climbing several flight of stairs				
			10. Moving out of a chair or bed				
			11. Using transport				
		Vision	12. Seeing and recognizing across a long distance				
			13. Seeing and recognizing a person across a short distance				
			14. Reading a book or newspaper				
		Hearing	15. Hearing a conversation with a person in a quiet room				
			16. Hearing someone talking on the other side of the room				
			17. Hearing a group conversation with at least three people				

		Sleep	18. Falling asleep				
			19 Waking up with ease				
		Cognition	20 Concentrating on doing something for at least 10 minutes				
			21 Remembering to do important things				
			22 Analysing and solving problems in day-to-day life				
			23 Learning a new task				
		Communication and speech	24 Understanding what people say				
			25 Starting and maintaining a conversation				
			26 Speaking clearly				
		Self-care	27 Grooming				
			28 Eating				
			29 Using the toilet				
			.				

	Social functioning	Social role and social interaction	How often do you:	All the time (3)	Most times (2)	Sometimes (1)	Not at all (0)
			30 do as much as others in the same job				
			31 do well as others in the same job				
			32 work for your regular number of hours				
			33 work for short period of time or take frequent rest because of your health				
			34 work at usual job but with some difficulty because of your health				
			35 get along with people who are close to you				
			36 isolate yourself from people around you				
			37 act affectionately towards others and maintain				

			friendship				
			38 act irritable towards people around you				
			39 participate in community volunteer activities				
			40 Find each day interesting and challenging				
			41 accomplish less than you would like				
S/ N	**Domain**	**Dimension**	**Items**	**All of the time (3)**	**Most of the time (2)**	**Sometimes (1)**	**Not at all (0)**
	Mental functioning		**How often do you feel**				
			42 being a nervous person				
			43 so down that nothing can cheer you up				
			44 calm and peaceful				
			45 being a happy person				

SECTION J: SOCIO- ECONOMIC CHARACTERISTICS.

1. Age: State your actual age ----------
2. Sex: Male ( ) Female ( )
3. Educational attainment: (a) No formal education (b) Non formal education (c) Primary education (d) Secondary education (e) Tertiary education
4. Kindly state the number of years of formal education ----------
5. Marital status: (a) Single (b) Married (c) Divorced (d) Widowed.
6. Marital duration: please indicate the actual number of years you have been married ----------
7. What is your husband occupation, please tick one from the options: (a) Farming (b) Trading (c) Carpentry (d) Bricklaying (e) others (specify)----------
8. What is the level of education of your husband (a) No formal education (b) Non formal education (c)Primary education (d) Secondary education (e) Tertiary education
9. kindly state the number of years of his formal education ----------
10. Religion: (a) Christianity (b) Islam (c) Traditional (d) Atheist
11. What is your primary occupation ----------
12. What are your other secondary occupation or income generating activities? (1)---------- (2)---------- (3) ----------
13. What is your average monthly income ----------
14. What is your household size ----------
15. Membership of association: (a) social organization (b) religious organization (c) political organization (d) cultural organization (e) do not belong to any association
16. How frequently do you visit urban area (a) daily (b) more than once a week (c) weekly (d) fortnightly (e) monthly (f) more than one month a year (g) annually (i) never.

APPENDIX II

UNIVERSITY OF IBADAN

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL DEVELOPMENT

FOCUS GROUP DISCUSSION GUIDE

Introduction to inform participants of the purpose of Focus group discussion guide (FGD).

I am a postgraduate student of University of Ibadan. I am conducting a research on CONTRIBUTION OF FOOD SAFETY BEHAVIOUR TO HEALTH STATUS OF RURAL DWELLERS IN SOUTHWESTERN NIGERIA. This guide is designed in order to elicit vital information for the award of of Doctor of Philosophy Degree. To this end your response and cooperation are solicited any information confidence. Thank you for your anticipated cooperation and valuable contribution toward the success of this research.

SECTION A

Knowledge of food safety

1. What do you consider when purchasing food items
2. How do you store food items
    a) Raw food
    b) Grains
3. What are the effects of washing hand during food preparation

b) How often do you wash hands during food preparation?

4. How and what should your kitchen area be protected from
5. How do you consider water from streams and wells for cooking
6. At what point do you consider meat safe for consumption
7. Is anything wrong with cooking while you are sick

SECTION B

Attitude to food safety

Hand washing before and during food preparation prevent food contamination

Clean environment/ kitchen prevent food borne illnesses

Separating raw and cooked food prevent food contamination

Drinking well/ stream water can make one sick.

Coughing and sneezing during food preparation can lead to food contamination.

Preparing food while sick can lead to food contamination.

SECTION C

Food safety practices

How often do you do these actions and why

a) Consumption of left overs within one day
b) Throwing away moldy food
c) Storing raw food items separate from cooked food
d) Wash hands during food preparation process
e) Wash dishes with water and soap
f) Cook meat thoroughly with no pink color or blood
g) Wash hands after handling rubbish / using toilet
h) Boil water from stream before drinking
i) Reheat left over food before eating it
j) Cover hair, scrub / cut nails clean before preparing food.

SECTION D

Constraints to food safety practices

What do you consider as issues preventing you from observing food safety practices and why?

How do you think this problem can be overcome?

SECTION E

Health care used

Have you or your household experience food-borne illness?

What health care do you utilize when sick and why?

SECTION F

Health status

How do you consider your health status in this area:

Physical functioning: daily living- bathing, dressing, vision, hearing, sleep, cognition, communication and speech, self-care (eating, using toilet)

Social functioning: performing your job well?

Social life: mix well with people, affectionate, irritable, participate voluntarily, and find each day interesting/challenging.

Mental functioning: Are you always nervous, hot tempered, so down, calm and peaceful, happy person.

Plate1: Participants in one of the Focus Group Discussion in Oyo West Local Government Area of Oyo State

Plate 2: A woman preparing food

Plate 3: Participants in one of the Focus Group Discussion in Awo (Ekiti State)

Plate 4: Participants in one of the Focus Group Discussion