

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND  
TECHNOLOGY**

**COLLEGE OF SCIENCE**

**DEPARTMENT OF FOOD SCIENCE AND TECHNOLOGY**

**ASSESSING THE FOOD SAFETY KNOWLEDGE OF FOOD  
HANDLERS OF THE GHANA SCHOOL FEEDING  
PROGRAMME IN TAMALE METROPOLIS, GHANA**

**BY**

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**A THESIS SUBMITTED TO THE DEPARTMENT OF FOOD  
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## ABSTRACT

The Ghana School Feeding Program provides children in deprived kindergarten and primary schools in the country with a hot and nutritious meal at school. Despite the numerous advantages the programme has achieved, there are wide spread media reports suggesting quality and safety challenges. Adequate food safety knowledge of food handlers of the feeding programme is vital for positive food safety attitude as well as good food safety practices. The overall objective of the study was to assess food safety knowledge, attitude and practices of the food handlers. Respondents answered questions critical to food safety involving food contamination, food preparation, personal hygiene, food hygiene and food storage (cold chain management). „Yes“ or „No“, „True“ or „False“ and in some cases a 3-point Likert scale of „Agree“, „Disagree“ or „Not Sure“ were used. Descriptive study utilizing frequencies, percentages and chi-square analysis were run using SPSS. Thirty (30) knowledge, fifteen (15) attitude and fourteen (14) practice questions/statements on food safety for forty (40) food handlers were assessed from ten (10) participating schools. Of the respondents, 70% (22) have no food safety training background while 30% (18) have had some food safety education. At least 20 of the food handlers provided overall scores of 67.4% correct responses for the knowledge statements indicating sufficient food safety knowledge while at least 35 showed positive attitude with 86.7% of the attitude statements and 74.1% for food safety practice. Despite these high scores, their knowledge, attitude and practices were poor with respect to some critical aspects of food safety, including food storage, food contamination, personal and food hygiene as well as food preparation with scores of 33.2%, 26.3% and 23.3% respectively which are below the cut off points of at least 66.7%, 85.7% and 70.5% respectively. Education, training and work experience had significant effect ( $p < 0.05$ ) on knowledge, attitude and practice. Trained food handlers had higher levels of sufficient food safety knowledge (86.7%), positive attitude (100%) and good practices (78.6%) compared to untrained food handlers who scored 50%, 93.4% and 64.3% for food safety knowledge, attitude and practices respectively. The levels of food safety knowledge, attitude and practices are therefore high among trained food handlers than those who are untrained. Those with at least 5 years of work in the food industry also showed higher food safety knowledge (63.4%) than those with at most 4 years“ work experience (53.3%). Therefore training and work experience impact positively on the food safety knowledge of food handlers.

## DECLARATION

This research project is my original work except where sources have been acknowledged. The work has never been submitted nor would it ever be, to another university for the award of a degree.

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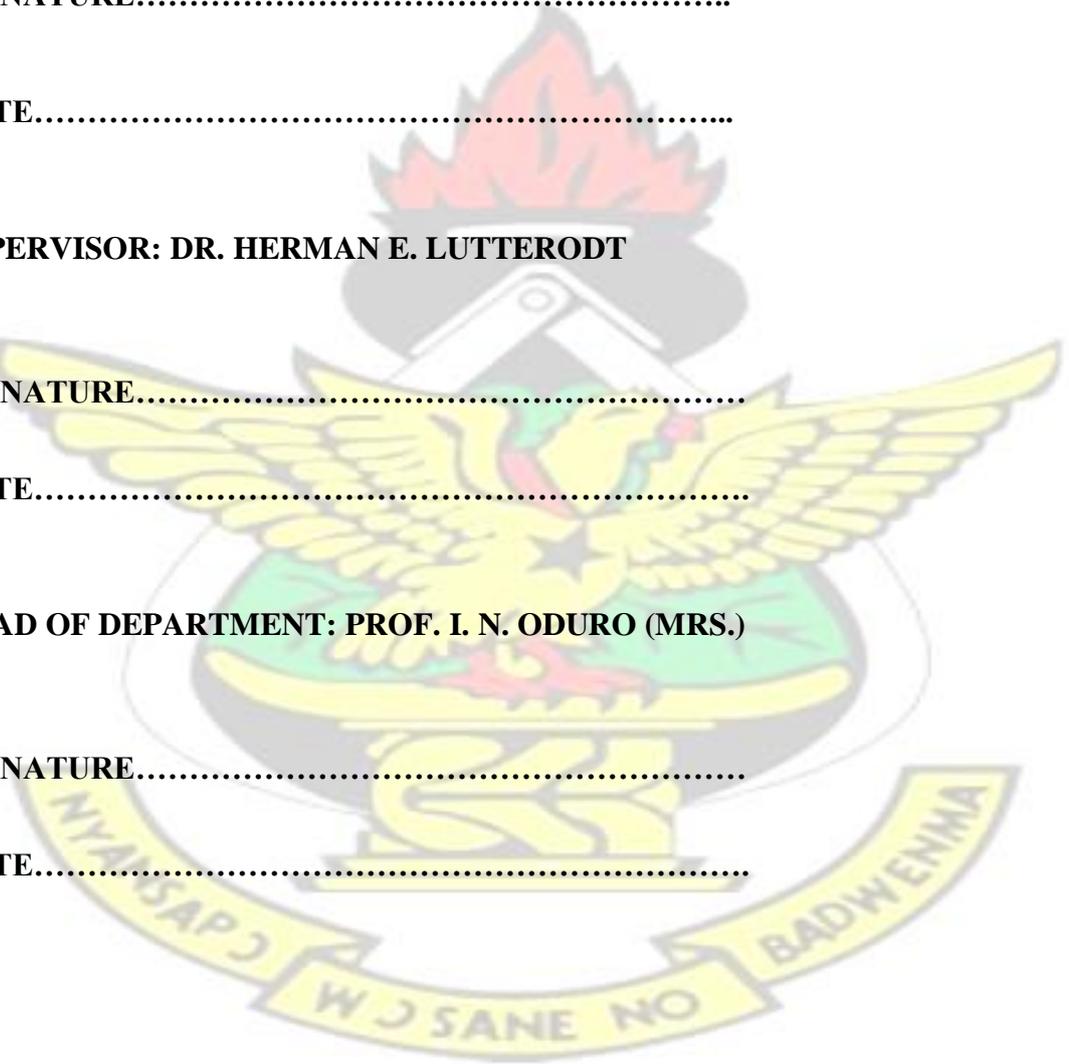
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## **ACKNOWLEDGEMENT**

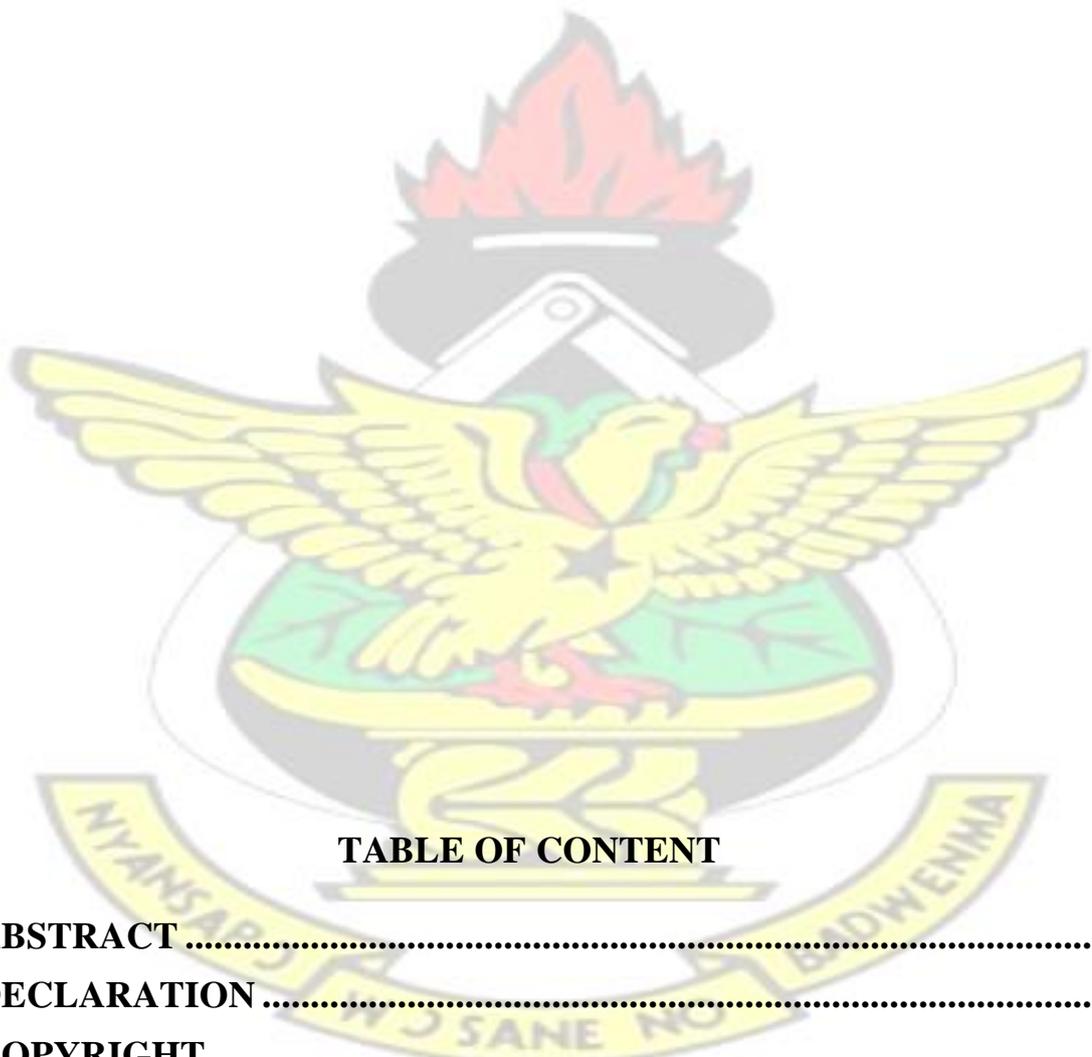
My profound appreciation and thanks go to the Almighty Allah for his guidance and support throughout my educational carrier and up to this height. Also, my appreciation goes to my parents and brethren who have been very dear to me throughout my academic struggle. May the good lord continuously bless you for your support and

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### **DEDICATION**

This work is dedicated to my parents: Mallam Bawah and Mma Alimatu as well as my siblings and wife; Ubaidatu for their contribution to my attainment of this educational height.

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## TABLE OF CONTENT

<b>ABSTRACT .....</b>	<b>i</b>
<b>DECLARATION .....</b>	<b>i</b>
<b>COPYRIGHT .....</b>	<b>ii</b>
<b>ACKNOWLEDGEMENT .....</b>	<b>iii</b>
<b>DEDICATION .....</b>	<b>iv</b>
<b>TABLE OF CONTENT .....</b>	<b>v</b>
<b>LIST OF TABLES.....</b>	<b>viii</b>

<b>LIST OF FIGURES.....</b>	<b>ix</b>
<b>LIST OF ACRONYMS .....</b>	<b>ix</b>
<b>CHAPTER ONE (1) .....</b>	<b>1</b>
1.0 Introduction .....	1
1.1 Statement of the Problem .....	2
1.2 OBJECTIVES OF THE STUDY.....	4
1.2.1 Main Objective.....	4
1.2.2 Specific Objectives.....	4
1.3 Significance of the Study.....	4
1.4 Organization of the Study.....	5
<b>CHAPTER TWO (2) .....</b>	<b>6</b>
<b>LITERATURE REVIEW.....</b>	<b>6</b>
2.0 Introduction.....	6
2.1 Knowledge, Attitudes and Practices (KAP).....	6
2.2 Food borne Diseases.....	8
2.3 Food Hygiene and Safety Education .....	10
2.4 Hand Hygiene .....	15
2.4.1 Hand Washing.....	16
2.4.2. Hand Maintenance.....	18
2.4.3 Bare Hand Contact with Ready to Eat (RTE) Food .....	19
2.5 Cross-Contamination.....	20
2.5.1 Sanitization of Areas Utilized for Prepping Raw Food .....	21
2.5.2 Separate Preparation of RTE Foods and Raw Foods .....	22
2.5.3 Storage of Food.....	23
2.5.4 Knowledge, Attitudes and Practices (KAP) on Food Safety and Food-borne Diseases.....	23
<b>CHAPTER THREE (3) .....</b>	<b>26</b>
<b>METHODOLOGY .....</b>	<b>26</b>
3.0 Introduction.....	26
3.1 Setting.....	26
3.2 Study Design.....	27
3.3 Definition of Terms .....	27

3.4 Study Participants.....	28
3.5 Sample Size .....	29
3.6 Sampling Procedure .....	30
3.7 Data Collection Methods and Tools.....	30
3.8 Tool Development.....	32
3.8.1 Validity and Reliability of the Tool .....	33
3.8.2 Testing the Questionnaire.....	33
3.8.3 Data Management and Processing .....	33
3.8.4 Statistical Analysis .....	34
3.9 Response Rate.....	36
<b>CHAPTER FOUR (4).....</b>	<b>36</b>
<b>RESULTS AND DISCUSSION .....</b>	<b>36</b>
4.0 Sex of Respondents .....	36
4.1 Age Distribution of Respondents .....	37
4.2 Educational Level of Participants .....	38
4.3 Job Position and Food Safety Background.....	39
4.4 Knowledge of Food Handlers .....	41
4.5 Attitude of Food Handlers .....	42
4.6 Food Safety Practice of Food Handlers.....	43
4.7 Relationship between Education, Food Safety Knowledge, Attitude and Practice	45
4.7.1 Knowledge and education.....	45
4.7.2 Education and Attitude .....	46
4.7.3 Education and Practice .....	46
4.8 Relationship between Job Position, Food Safety Knowledge, Attitude and Practice.....	46
4.8.1 Job Position and Food Safety Knowledge .....	46
4.8.2 Job position and Attitude .....	47
4.8.3 Job Position and Food safety Practice .....	48
4.8.4 Work Experience and KA.....	49
4.8.5 Training and KAP .....	51
<b>CHAPTER FIVE (5).....</b>	<b>53</b>

<b>5.0 CONCLUSION AND RECOMMENDATIONS .....</b>	<b>53</b>
5.1 Conclusion .....	53
5.2 Recommendations .....	54
<b>REFERENCES .....</b>	<b>55</b>
<b>APPENDIX A .....</b>	<b>60</b>
<b>APPENDIX B.....</b>	<b>61</b>
<b>APPENDIX C .....</b>	<b>62</b>
<b>APPENDIX D .....</b>	<b>67</b>
<b>APPENDIX E.....</b>	<b>68</b>

## LIST OF TABLES

Table 3.1: Distribution of Respondents .....	30
Table 4.1: Areas of Insufficient Knowledge of Food Safety .....	43
Table 4.2 Scores by Statements for Food Safety Attitude.....	47
Table 4.3 Scores for food Safety Practice Statements .....	48
Table 4.4: Food Safety Knowledge and Education .....	47
Table 4. 5: Job Position and Food Safety Knowledge .....	48
Table 4. 6: Statements Significantly Related Job Position .....	49
Table 4. 7: Work experience and knowledge .....	51

## LIST OF FIGURES

Figure 4.1: Age Distribution of Respondents: .....	39
Figure 4.2: Educational Level of Respondents: .....	40
Figure 4.3: Work Experience of Participants: . .....	42
Figure 4.4: Job Position and Food Safety Practice. ....	50
Figure 4.5: Work Experience and KAP. ....	52
Figure 4.6: Training and KPA. ....	54



## LIST OF ACRONYMS

AIDS: Acquired Immune Deficiency Syndrome

CDC: Centre for Disease Control

CCP: Critical Control Point

DHMT: District Health Management Team

EHOs: Environmental Health Officers

FDA: Food and Drugs Authority

GAIN: Ghana Agricultural Initiative Network

GOG: Government of Ghana

GHS: Ghana Health Service

GLSS: Ghana Living Standard Survey

GSFP: Ghana School Feeding Programmed

HACCP: Hazard Analysis and Critical Control Point

HAM: Health Action Model

HH: Hand Hygiene

ISD: Inspectional Services Department

KAP: Knowledge, Attitude and Practices

KNUST: Kwame Nkrumah University of Science and Technology

MDG: Millennium Development Goals

MLDRG: Ministry of Local Government and Rural Development

NEPAD: New Partnership for Africa's Development

NGO: Non-Governmental Organization

NRAEF: National Restaurant Association Educational Foundation

RTEF: Ready to eat Food

SEND: Social Enterprise Development Organization

SFP: School Feeding Programmed

SNV: Netherlands Development Cooperation

UNAIDS: United States Agency for Intermittent Development

UN MDGs: United Nations Millennium Development Goals

USDA: United States Development Agency

USFDA: United States Food and Drug Administration

WFP: World Food Programmed

WHO: World Health Organization

WSDH: Washington State Department of Health

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## CHAPTER ONE (1)

### 1.0 Introduction

The Ghana School Feeding Program (GSFP) was initiated by the New Partnership for Africa's Development (NEPAD), together with the Governments of Ghana (GOG) and the Netherlands. The program is part of the measures adopted to achieve the United Nations Millennium Development Goals (UN MDGs) concerning the eradication of hunger, poverty and encouraging primary education (GOG, 2006). The overall objective of the GSFP is to „Contribute to Poverty Reduction and Food security.” The specific objectives of the program are three-fold. First, the program aims at increasing student enrolment, attendance and retention rates. The second specific objective of the program is to reduce hunger and malnutrition among children who are in public kindergartens and primary schools. The third objective of the program is aimed at strengthening food production networks (GOG, 2006). This can be achieved by the home-grown component of the program and thus serves as an avenue for the schools to provide a market for the agricultural products of farmers in the community. In the long run, this aspect of the program will strengthen the local food production and consumption network within the participating communities. This in turn has the potential to boost domestic food production and increase the food sovereignty of the country (GSFP, 2007).

The program started in 2005 with 10 pilot schools in different regions of the country and the implementation period runs until the end of 2010 when the programme was fully implemented (GOG, 2006). The basic concept of the GSFP is to provide children in kindergartens and primary schools in the poorest regions of the country with a hot and nutritious meal at school (GOG, 2006). By August 2006, it had been expanded to 200 schools covering 69,000 pupils in all 138 districts. By the end of December 2006,

the number of participating school had increased to 598 with a total student population of 234,800. As at March 2007, the programme, benefiting 408,989 pupils daily, had reached 975 schools. Thus, by the end of the first quarter of 2007, the GSFP had already surpassed the 2007-year end target of 889 schools and 320,000 children set in the Programme Document (GSFP, 2010). For the 2007/2008 academic year, 441,189 pupils were fed. As at end of 2008/2009 academic year, the total number of pupils being fed daily was 656,624. This represents 22% of all kindergarten and primary school pupils in the country (SNV, 2010). The figures for 2011 and 2012 stood at 700,202 and 1,113,928 pupils respectively, an indication of its tremendous impact on education as reported by monitoring reports from NGOs like Netherlands Development Cooperation,(SNV), Ghana Agricultural Initiative Network (GAIN) and World Food Programme (WFP) as well as the annual reports of the GSFP itself, reported increased figures concerning pupil enrolment and attendance at the beneficiary schools of the program, compared with schools not serving meals. The World Health Organization (WHO, 2002) describes important population factors which could result in a high susceptibility to food-borne infections. According to the WHO, age is an important factor because those at the extremes of age have either not developed or have partially lost protection from infection. People with a weakened immune system also become infected with food-borne pathogens at lower doses which may not produce an adverse reaction in healthier persons. In developing countries reduced immunity due to poor nutritional status render people, particularly infants and children, more susceptible to food-borne infections (WHO, 2002).

### **1.1 Statement of the Problem**

The school feeding programme is an educational policy with numerous advantages as evident by many research findings with the ultimate aim of benefiting all public basic

schools across the country. Many school children are assured of food and this is a relief to many parents, especially the poor. Despite the enormous contribution of this important social intervention through education, there are numerous food safety challenges confronting this well-intended programme. As a domestic feeding programme, it is faced with all the challenges of food contamination, unhygienic conditions and sanitation. The vast majority of outbreaks of food-related illness are due to microbial pathogens as well as chemical and physical contaminants. Much time and effort must therefore be spent in controlling and/or eliminating them.

The programme is run in public basic schools and so any food safety and quality challenges will be of serious public health concern. Many food safety issues have been raised with regards to the sanitary and hygienic conditions under which food is prepared for pupils. There have been serious concerns with regards to the quality of ingredients used in preparing the food. On one account, a caterer was interdicted after maggots were found in the food of some students, an incident reported by XYZ Radio, a local radio station in Accra on 19<sup>th</sup> July, 2013. On another account it was reported by XYZ station on September 10, 2013 that some school children in Accra who are beneficiaries of the SFP complaining about the safety and quality of food served to them by caterers. Some of them who spoke to XYZ's Strict Proof Program say they continue to suffer diarrhea and other food borne diseases and have completely stopped eating the food. Some Teachers shared this concern and intimated that low supervision by program coordinators has allowed caterers to compromise on the safety and quality of food prepared. According the report, one pupil told the program "I always go to toilet when I eat the food so I have stopped eating the food." Another pupil said "House flies play on our food. My friends get diarrhoea and they are suffering".

On July 17, 2013, it was reported by the BBC (<http://www.bbc.com/news/world-asiaindia-23337445>) that at least 22 children died and dozens more have fallen sick after eating a school meal in India's eastern state of Bihar. The poisoning occurred at a government school in the village of Masrakh in Saran district. India's Mid-Day Meal Scheme provides free food in order to boost attendance, but often suffers from poor hygiene practices just as it is the case in Ghana. A very serious cue must therefore be taken from India's experience because Ghana is not immune from such occurrences since the safety of the food is highly questionable, hence the need for this study.

## **1.2 OBJECTIVES OF THE STUDY**

### **1.2.1 Main Objective**

To assess food safety knowledge, attitudes and practices of food handlers who prepare food for pupils fed by the Ghana School Feeding Programme.

### **1.2.2 Specific Objectives**

- 1) To assess the food safety knowledge of cooks and caterers.
- 2) To determine whether the knowledge translate into positive food safety attitude.
- 3) To determine whether the knowledge translate into safe food practices.

### **1.3 Significance of the Study**

This study seeks to understand the special problems of food quality and safety within the Ghana School Feeding Programme, especially, the potential of microbial food pathogens to be introduced into the food fed to pupils.

The information and results obtained will help programme administrators, participants and public health workers to assess programme operations using the findings as a first-hand information, and put steps in place to improve the safety of the feeding programme.

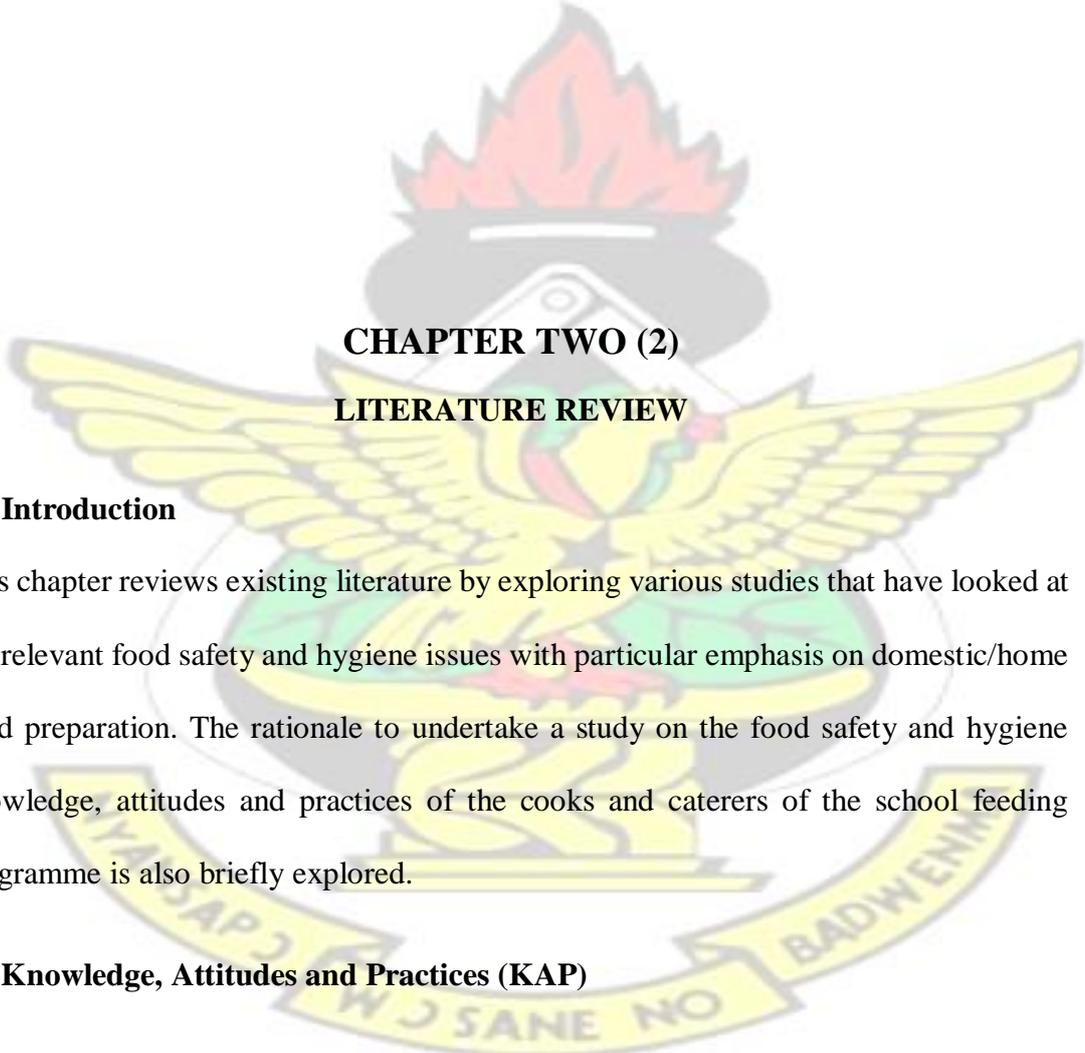
The findings of the research will help build the confidence of parents in the safety of the food provided to their children in school and allay their fears about any possibility of food contamination and poisoning. Also, the implementing agency of the feeding programme will on the basis of the findings of this research put measures in place to streamline the programme by designing and implementing food safety interventions such as the Hazard Analysis and Critical Control Point (HACCP) so as to guarantee the safety of the food and for that matter the health of beneficiary pupils.

The study may be used as a reference material by the Ministry of Local Government and Rural Development, the Ministry of Education as well as the Ministry of Health and other relevant agencies. In the long run, the study will serve as a basis for future research in the field of food safety and hygiene.

#### **1.4 Organization of the Study**

The study is organized into five chapters. Chapter one is the introductory chapter and it highlights the background of the research. Chapter two presents the review of relevant literature, while chapter three outlines the research methodology and includes conceptual and theoretical frameworks, methods and sources of data collection, methods of data analysis, description and measurement of variables, geographical area of the study, sample size and sampling procedures as well as limitations of the study. Chapter four presents and discusses the results and findings of the study while chapter five presents the conclusions and policy recommendations as well as suggestions for improvement of the performance of the School Feeding Programme in Ghana and for future research.

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## **CHAPTER TWO (2)** **LITERATURE REVIEW**

### **2.0 Introduction**

This chapter reviews existing literature by exploring various studies that have looked at the relevant food safety and hygiene issues with particular emphasis on domestic/home food preparation. The rationale to undertake a study on the food safety and hygiene knowledge, attitudes and practices of the cooks and caterers of the school feeding programme is also briefly explored.

### **2.1 Knowledge, Attitudes and Practices (KAP)**

The KAP model often explains the relationship between knowledge, attitudes and practices (Simelane, 2005). Knowledge is acquired through continuous learning processes either through formal or informal instruction, personal experience and sharing of experiences by individuals (Glanz & Lewis, 2002). Traditionally, the assumption has

been that knowledge is automatically translated into behavior or practice (Glanz & Lewis, 2002). It is however theorized by behaviour change theorists, especially in the field of HIV that knowledge does not translate into appropriate behavior modification (UNAIDS 2004, Shisana & Simbayi, 2002, Glanz & Lewis, 2002).

Knowledge is very significant and equally vital in the cognitive processing of information with regards to the attitude-behaviour relationship (Simelane, 2005).

Attitude involves concepts that are associated with peoples' thinking, feeling and behavior. (Keller, 1998). Its components include cognition, emotion and a behavior; each of which refers to what one knows, how one feels and what one does respectively (Keller, 1998).

As postulated by Rutter *et al.*, (2003), attitudes have much influence one's intention to implement a given behaviour or practice, hence their correlation with behavior. For instance, persons with positive attitudes towards appropriate hand-washing are more likely to wash their hands and vice versa. (Simelane, 2005). However, arguments emanating from some social scientists hold that KAP surveys are very much inadequate and are simply insufficient to provide information enough for planning. The use of questionnaire has the tendency to leave out very critical elements in such an assessment and more information could be obtained with the combined use of both qualitative methods and questionnaire for its additional benefit in eliciting information since many studies have failed to explain the logic behind the behavior. (Launiala, 2009). Another concern is with regards to the assumption that knowledge and behavior are directly related. However, it has been found in the field of health that knowledge is not the only influential factor for treatment seeking practices and as such behavior health programmes to address a number other cross-cutting of issues ranging from socio-cultural, environmental, economical and structural factors (Launiala, 2009). A study conducted by behaviourists Ajzen (2002), Keller, (1998) and Glanz *et al.*, (2002)

identified a number of other factors that can influence one or more of the KAP variables as self-esteem, self-efficacy and misconception.

## **2.2 Food borne Diseases**

Contaminated food and water have been sources of illness in all human societies since ancient times. In contemporary societies across the world, food-borne diseases are still among the most widespread health problems. The health burden posed by foodborne diseases in both developing and developed countries is substantial. The severity of the illness is often fatal even though, the burden of food-borne disease is not well defined at the global, regional or at country levels (WHO Food Safety, undated).

Estimating the burden of food-borne diseases is even more complex due to the fact that very few illnesses can be definitively attributed to food. These links are only made during situations of outbreaks (Flint *et al.*, 2005). Food-borne diseases often go undetected or underreported making it really difficult to establish the extent of the problem. It is currently estimated at 1.8 million deaths, which is only a tip of the iceberg (WHO Food Safety, undated). The basis for the estimation of the burden attributable to food and specific pathogens that are commonly transmitted is established by studies that determine the burden of acute gastroenteritis. Although not all acute gastrointestinal diseases are food-borne and food-borne diseases do not always result in acute gastroenteritis, food remains an important vehicle for pathogens that cause acute gastroenteritis (Flint *et al.*, 2005). It is more difficult to obtain global or regional estimates of food-borne illnesses by putting together data obtained from various countries because of the influences of the various study design and existing surveillance systems which must be considered (Flint *et al.*, 2005). With respect to the difficulty emanating from study design, prospective and retrospective studies yield different disease estimates. Prospective cohort studies contain community and etiologic

components, while retrospective study designs are mainly cross-sectional surveys with or without supporting targeted studies. Prospective cohort studies, although expensive, provide community incidence rates that are pathogen specific. In cross sectional surveys, investigators ascertain the prevalence of self-reported acute gastroenteritis among persons in the community during a set period of time. For example, in a retrospective study in the United Kingdom, reported an incidence of 5.5 cases per person-year but a subsequent prospective study found and reported a calculated incidence which is almost 3 times that of the prospective study (Infectious Intestinal Diseases Study Team, 2000). When retrospective estimate of food-borne diseases burden from studies conducted in the United Kingdom, Australia, Canada, Ireland, and the United States were compared, the results were similar to previous estimates from other retrospective studies (Palmer, Houston, Lervy, Riberio & Thomas, 1996; Feldman & Banatvala, 1994; Flint *et al.*, 2005). On the other hand, prospective estimates from both an English study and another conducted in the Netherlands are similar (Infectious Intestinal Diseases Study Team, 2000; Wit de, Koopmans & Kortbeek, 2001). Reasons for the differences between study designs have been attributed to recall bias or telescoping (Infectious Intestinal Diseases Study Team, 2000). A more thorough examination of the effect of study design on disease estimates is therefore required prior to a comparison of data from various national studies. Estimates of the incidence of acute gastroenteritis during childhood give inferences about the enormity of the problem since a high proportion of cases are caused by food-borne pathogens (Flint *et al.*, 2005). According to FAO estimates, as much as 70% of diarrhoeal diseases in developing countries are believed to be of food-borne origin (FAO, 1995). As recognized by the World Health Organization (WHO), food-borne diseases include a wide spectrum of illnesses which are a fast growing public health

concern worldwide and contribute greatly to illness, compromised nutritional status, loss of immunity to disease and loss of productivity (WHO, undated). New challenges for food safety have also emanating from the globalization of the food supply system contributing greatly to the international public

health problem of food-borne diseases. This is because of the growing industrialization and trade of food produce, rapid urbanization associated with increased food preparation and consumption outside the home and the emergence of new or antibiotic-resistant pathogens and food vehicles (WHO, undated). Effective and sustainable efforts aimed at preventing food-borne diseases at national and international levels are possible if the magnitude of the problem is determined. In light of this, the WHO has embarked in 2010 on a Global Initiative to Estimate the Global Burden of Diseases in conjunction with multiple partners (WHO, undated). The South African Department of Health has also recognized that food-borne disease outbreaks are under-reported. Most diarrhoeal illness resolve within 24 to 48 hours without any medical attention, so many food-related illnesses are not diagnosed and associated food-borne disease outbreaks are often not recognized (Department of Health, 2009). The Department of Health is also of the view that “when people seek medical attention, health workers are less likely to report these less severe conditions”, thus posing a challenge to the health care system to maintain the knowledge and resources to identify and respond to these outbreaks (Department of Health, 2009).

### **2.3 Food Hygiene and Safety Education**

Providing education for personnel in the food industry in hygiene matters is an effective means of improving food handling practices, and thus, the safety of food (WHO, 1996; FAO 1997). This is because; human handling errors have been responsible for most

outbreaks of food poisoning in developing and developed countries (Clayton, *et al.*, 2002; Ehriri & Morris, 1996; Todd *et al.*, 2007; Howes, *et al.*, 1996).

For example, food handlers infected with the hepatitis A virus can introduce the virus into food if the food is handled with unwashed hands. Therefore, good personal hygiene, as well as, sanitary handling practices in the food processing sector is an essential component of any prevention programmes for food safety (Clayton *et al.*, 2002; Todd *et al.*, 2007).

According to the Centers for Disease Control (CDC), the following five risk factors related to the human factor and preparation methods contribute to the high prevalence of food-borne illness:

1. Improper holding temperatures,
2. Inadequate cooking,
3. Contaminated equipment,
4. Food from an unsafe source
5. Poor personal hygiene (Incidence of Food-borne Illness, 2010).

A tool has been developed by the WHO known as the five keys to safer foods to enhance food safety behaviours that if followed, or adopted, can reduce foodborne illness occurrence. These five keys are specific behaviours each linked to the five risk factors identified by CDC that will likely reduce food-borne illness.

The 5 Keys to Safer Foods are:

1. Keep clean,
2. Separate raw and cooked,
3. Cook thoroughly,
4. Keep food at safe temperature,
5. Use safe water and raw materials (WHO, 2007).

No documented evidence however exist about improvements in food hygiene

standards which can be directly related to education or training as there is very limited information or studies conducted to assess the impact of education in the informal sector(Rennie, 1994).

Studies of the effect of food hygiene education in countries such as the United Kingdom, United States, Saudi Arabia and Romania prior to 1994, identified increased knowledge levels of participants, and improvements in the relationship between players in the food industry and personnel of enforcement agencies due to a common understanding that resulted from the study. However, despite the increased knowledge, improvement in food handling behaviour was not clearly demonstrated (Rennie, 1994). In the formal food sector, regulatory agencies use inspections and education of food handlers as the two most effective methods of ensuring food safety. In the United States for example, effectiveness of food handler education and inspections in ensuring food safety has been questioned due to variations in the implementation of these measures. (Riben *et al.*, 1998). Riben *et al.*, (1998) reviewed the training and inspection reports of the Boston Inspectional Services Department (ISD) to assess the effectiveness of inspections and training on food safety and hygiene. The inspection records identified 42 different violations which included critical items that are associated with food-borne illnesses and others described as non-critical that play a minor role in causing food-borne illnesses. Scores were calculated by deleting points from a perfect inspection score of 100 (no noted violations). Thus inspection scores could range from 0 to 100. A training programme was therefore instituted in 1988, by the Boston Inspectional Services Department.

In the training programme, participation was mandatory for managers of restaurants whose licenses of operation were suspended as a result of conditions that were found on inspection that constituted an immediate threat to health. Also, for restaurants linked

epidemiologically to cases of food-borne illness. Participation by restaurant managers outside these categories of violations was voluntary. Riben *et al.*, (1998) then analyzed the routine inspection records, following the training from 1989 to 1992 for three groups of restaurants: a mandatory group, a voluntary group and a control group (no staff attended the training). The authors looked at records before the training (baseline), one year after training and two years after training (Riben *et al.*, 1998). The evidence regarding the effectiveness of food handler training in improving food safety was weak, but it appeared that some training resulted in improved inspection scores (Riben *et al.*, 1998). It also appeared that inspections were beneficial as worse inspection scores were noted where no inspections were previously conducted (Riben *et al.*, 1998).

Another study was conducted by Campbell and co in Canada to systematically review and to investigate the effectiveness of food safety training as an intervention (Campbell *et al.*, 1998). Multiple inclusion criteria were used for the studies including study design (controlled trials, cohort, case-control, pre-test/post-test without control, cross-sectional, ecological and time series); studies with specific interventions (inspection-based, food handler training and community based education); study selection of participants (food handlers working in the formal environment) and study outcomes (changes in inspection scores, knowledge of food safety practices and violation of inspection criteria). Quality assessment of the 34 studies included on the basis of the inclusion criteria categorized and rated 1 study as strong, 14 were moderate and 19 were weak. Therefore, only 15 studies were included in the systematic review. Interventions from the 15 studies were grouped into three categories of public health interventions regarded as important to enhance food safety: inspections, food handler training, and community-based education (Campbell *et al.*, 1998). Findings from the systematic review suggest that these multiple public health interventions are effective in assuring

food safety, since routine inspection of food service premises (at least one inspection per annum) was effective in reducing the risk of food-borne illness as determined through improved inspection scores; food handler training can improve the knowledge and practices of food handlers, particularly if combined with certification; and selected community based education programs can increase public knowledge of food safety (Campbell *et al.*, 1998).

A time-series experimental study was conducted in the United Kingdom as a result of unsatisfactory conformance to food safety standards following inspections (Rudder, 2006). The aim of the study was to identify barriers to compliance in 40 food retail businesses. Environmental Health Officers (EHOs) conducted risk assessments on food safety through inspections at these establishments and the businesses were categorized according to their performance. After a period of six months these businesses were offered advice, seminars and direct support. Thereafter, a further risk assessment was done Rudder (2006) reported that 65% of the businesses had improved their risk profile, 15% had remained the same, 10% had some deterioration and a further 10% had completely deteriorated. The authors concluded that lack of knowledge and understanding of the principles of food safety coupled with language difficulties, were significant barriers to promoting food safety and that supportive activities can make a significant impact on practices (Rudder, 2006).

Aware of the lack of studies and clarity on the impact of training on food safety behaviours within the food industry, Nieto-Montenegro, Brown and LaBorde (2008) undertook a study that looked at developing and assessing a pilot food safety educational material and training strategy for Hispanic workers using the Health

Action Model (HAM) (Nieto-Montenegro *et al.*, 2008). HAM takes into account the social and environmental factors around the worker that may impact on adoption of behaviours (Tones *et al.*, 1990; Nieto-Montenegro *et al.*, 2006).

Seaman and Eves indicate that the Health Action Model gives the most thorough description of factors that may influence behaviour change following hygiene training (Seaman & Eves, 2006). The study conducted by Nieto-Montenegro *et al.*, in 2008 using the HAM, found that the educational lessons alone produced a significant increase in knowledge and hand washing after using the restroom. With supervisor reinforcement after training, hand washing before work and after breaks also increased significantly although there was no effect with the monetary incentive (Nieto-Montenegro *et al.*, 2008). This study showed that elements of knowledge and motivational systems are important and that training is enhanced by supervisory reinforcement of the behavioural rules with the personnel. Its premise is similar to the type of study needed to assess the effectiveness of training of street food vendor training.

#### **2.4 Hand Hygiene**

Any establishment that handles the public's food has potential for the development of food borne illnesses to occur within their operations. The prevention of food borne illness through being aware and practicing food safety and sanitation must be stressed by the establishment to their employees. The three most significant contributors to food borne illnesses in restaurants include time-temperature abuse, personal hygiene, and cross contamination (Pilling *et al.*, 2008). Due to these factors, populations such as the elderly, young children, people who are ill, people who are taking medication and pregnant women are highly susceptible and more likely to contract a food borne illness from unsafe food. The importance of good hand hygiene practices has been

corroborated in the laboratory where it has been show that if food handlers become infected and/or equipment becomes contaminated with enteric pathogens, poor hand hygiene could transmit pathogens to customers (Daniels *et al.*, 2000). Establishments that handle food must be knowledgeable and adhere to sanitation guidelines and practices; it begins with the employees and their own personal hygiene. Good hygiene is the foundation for preventing the spread of food borne illness.

#### **2.4.1 Hand Washing**

The most common source of contamination is humans (Green& Selman, 2005), more specifically food contact with hands (Anonymous, 1985). If a food worker is not clean, the food can become contaminated (McSwane, Rue, & Linton, 2003). Food workers may transmit pathogens to food with hands that are contaminated with organisms from their gastrointestinal tract; therefore hand contact with RTE food represents a potentially important mechanism by which pathogens may enter the food supply (Guzewich & Ross, 1999). RTE foods are edible items safe to eat without further cooking (Green *et al.*, 2006). Because the transmission of pathogens from food worker hands to food is a significant contributor to food borne illness outbreaks, improvement of food worker hand washing practices is critical (Green *et al.*, 2006). Therefore, personnel must be shown how to properly wash hands and at the appropriate instances of when to wash their hands. Simply touching human skin can transfer *Staphylococcus aureus*, a dangerous bacteria causing Staph infection, from one surface to another; as a result of touching human skin then handling RTE food, this simple action can pass *Staphylococcus aureus* from skin to food making food potentially hazardous.

According to the National Restaurant Association Educational Foundation (2004), to ensure proper hand washing you must wet your hands under running water of at least 100°F, apply soap, vigorously scrub hands and arms for at least 20 seconds, clean under

fingernails and between fingers, rinse thoroughly under running water of at least 100°F, then dry hands and arms with single-use paper towels.

Personnel should not be allowed at any time to think or be given the impression that gloves and gel hand sanitizer are adequate substitutes for washing one's hands with soap and hot water. Foodservice workers should wash their hands frequently and in the proper manner. Shockingly, research has shown that as many as 60% of food handlers do not wash their hands properly or often enough (Roberts, 2008). In a study that conducted research on catering food safety, hand hygiene malpractice occurred more frequently than malpractice for cleaning surfaces and equipment as well as malpractice of washing utensils (Clayton *et al.*, 2004).

Clayton *et al.*, (2004) also found that:

Hand washing was poorly carried out after food handlers touched their face/hair and on entering the kitchen. These actions were performed adequately only on 9% of occasions where food handlers touched their face/hair and 14% of required occasions where food handlers entered the kitchen. There were 1,096 attempts to carry out a hand hygiene action, of which 332 were judged to be adequate.

Food handlers must be aware of the appropriate instances in which they need to wash their hands.

The FDA Food Code (2009) stated food employees should immediately wash their hands before engaging in food preparation and working with ready-to-eat food, clean equipment, and clean utensils. Food employees should wash hands after touching bare human body parts other than clean hands and clean, exposed portions of arms, after using the restroom, after caring for or handling service animals or aquatic animals, after coughing, sneezing, using a handkerchief or disposable tissue, using tobacco, eating or drinking, after handling soiled equipment or utensils, during food preparation when

removing soil and contamination to prevent cross contamination when changing tasks, when switching between working with raw food and working with ready-to-eat food, before putting on gloves for working with food, and lastly, after engaging in other activities that contaminate the hands.

As simple as the act of hand washing may seem, the development and supervision of this behavior is detrimental in the prevention of food borne illnesses in foodservice establishments. Managers must train food handlers when and how to wash their hands properly, and then must monitor hand washing frequency (NRAEF, 2004). Vigorous hand washing with soap, performed consistently at appropriate intervals, is necessary to control the spread of all enteric pathogens (CDC, 1990).

#### **2.4.2. Hand Maintenance**

Food workers must also consider hand care in conjunction with proper hand washing to help prevent the transmission of microorganisms. A food worker should have short, clean fingernails and false fingernails should never be worn. False or acrylic fingernails trap debris and could become a physical hazard as they may lose their adhesiveness and break off into the food being prepared, thus contaminating the food. Physical hazards are objects in food that may cause injury if eaten (WSDH, 2005).

False and acrylic fingernails can harbor significant types and amounts of bacteria. A 2007 study on public health implications of false fingernails in the food service industry found that artificial fingernails housed *Staphylococcus aureus*, *Escherichia coli*, *Proteus sp.*, and *Pseudomonas aeruginosa*. The study stated out of 350 subjects, *Staphylococcus aureus* was found in 41.7% of participants, 7.4% of participants were found with *Escherichia coli*, 1.7% housed *Proteus sp.*, and 1.4% was found with *Pseudomonas aeruginosa* (Wachukwu *et al.*, 2007). Another physical hazard that could

contaminate food is nail polish. Nail polish is also forbidden as it can disguise dirt under the nails and may flake off into food (NRAEF, 2004).

Food workers must also be aware of cuts and abrasions since they are sources of bacteria (Anonymous, 1985). Any food worker who has infected wounds on the hands should not work with food, touch utensils, or equipment as this can transfer harmful bacteria such as *Streptococcus* and *Staphylococcus aureus* from the infected wound to food or equipment. An epidemiological study discovered a food handler at a restaurant, who had been examined for severe cellulitis of the left hand, had prepared egg salad for a group of people. The pus pimples from the cellulitis were exposed to the mayonnaise and vinegar ingredients of the egg salad, thus causing a group A, type 25, beta hemolytic streptococcus outbreak in 60 out of 86 individuals who ingested the egg salad (Farber & Korff, 1958). Food workers who have wounds or sores on the hands must wear finger cots or bandages to contain the wounds then place clean gloves on their hands to cover the bandages and protect food from any transfer of dangerous bacteria.

#### **2.4.3 Bare Hand Contact with Ready to Eat (RTE) Food**

A food worker must never touch RTE food with their bare hands since this can place the food in direct contact with a surface that contains dangerous microorganisms. RTE foods are edible items safe to eat without any further cooking. If food workers are handling RTE foods, there must be a barrier between the food workers' hands and the RTE foods. Gloves are commonly used as barriers in food service establishments, and anecdotal evidence suggests that glove use for this purpose may be increasing (Green *et al.*, 2007). Gloves should always be utilized for single-use and never be washed then re-used. Proper glove use can decrease the transfer of pathogens from hands to food (Michaels *et al.*, 2004).

Food handlers should wear gloves when in the kitchen or preparing food, when preparing raw meat or poultry, when hands have cuts or scratches, and when preparing RTE foods (Green *et al.*, 2005). Food handlers should change their gloves as soon as they become soiled or torn, before beginning a different task, every four hours during continual use or more often when necessary, after handling raw meat and before handling RTE food (National Restaurant Association Educational Foundation, 2004), and wash hands with every glove change (Green *et al.*, 2005).

Gloves also should never be the primary way to keeping food safe from bacteria on hands. Many food workers consider gloves to be more sanitary than washing hands since they are not directly touching RTE food with their bare hands. Researchers argue whether glove use has led to less hand washing practices in food handlers. Studies have suggested that glove use might be counterproductive because workers might wash their hands less frequently when gloved (Lynch *et al.*, 2005). In an observation study of hand hygiene actions, only 30% in the instances observed did food handlers correctly perform proper hand washing and washing their hands at the appropriate times in which they should have washed their hands (Clayton *et al.*, 2004). Due to this false sense of security, food handlers might not change gloves as often as necessary therefore managers must reinforce the habit of proper hand sanitation with food handlers (NRAEF, 2004).

### **2.5 Cross-Contamination**

Microorganisms move easily around in a kitchen and cross-contamination can occur at any point in operation (NRAEF, 2004). When raw food products come in contact with any surface, piece of equipment, utensils, or even the foodservice employees' hands, those surfaces become contaminated with microorganisms. Cross-

contamination is defined as the point where microorganisms are transferred from one surface to another (Roberts, 2008). If RTE food comes in contact with the surfaces contaminated by raw food products, the RTE food is now contaminated and could potentially cause food borne illness if consumed. A food borne illness can result if cross-contamination is allowed to occur in any of the following ways:

- ✓ Raw contaminated ingredients added to food that receives no further cooking
- ✓ Food-contact surfaces not properly cleaned
- ✓ Raw food-contact surfaces are not sanitized before touching cooked or RTE food
- ✓ Raw food allowed to touch or drip fluids onto cooked or RTE food (NRAEF, 2004).

Cross-contamination can be fairly easy to prevent as long as food handlers are properly trained to recognize where microorganisms lie and how microorganisms are transferred.

### **2.5.1 Sanitization of Areas Utilized for Prepping Raw Food**

Work stations, utensils, and equipment used for food preparation must be cleaned and sanitized before they become in contact with RTE foods. In food safety, the term clean is defined as free of visible soil and the term sanitary is defined as the number of microorganisms on the surface has been reduced to safe levels (NRAEF, 2004). Every time work areas, utensils, and equipment are used by a food handler, it must be cleaned and sanitized to prevent cross-contamination. Food can become contaminated through direct or indirect contact with pathogenic food items. A direct food-contact surface includes any equipment or utensil surface that normally touches food and an indirect food-contact surface is a surface food might drain, drip, or splash onto during preparation (NRAEF, 2004). A food borne illness outbreak investigation in Oklahoma found that 14 out of 25 people had contracted *Campylobacter jejuni* from

crosscontaminated food item of lasagna, which was prepared after a cook had cut raw chicken and inadequately washed the work area and utensils (Graves *et al.*, 1998). After cutting up raw chicken, it is not enough to simply rinse the cutting board and knife; food handlers must wash, rinse, and sanitize cutting boards and utensils in a three-compartment sink or run them through a ware washing machine (NRAEF, 2004).

### **2.5.2 Separate Preparation of RTE Foods and Raw Foods**

Cross-contamination of produce and raw meat is more common in produce (McCabeSellers & Beattie., 2004). Raw foods and RTE foods should never be prepared next to each other nor should the same equipment be used to prepare raw food then be used immediately to prepare RTE food. Foodservice establishments will designate specific areas of the kitchen to prepare raw foods and RTE foods in. This minimizes the chance for microorganisms from raw food to contaminate RTE food. If an establishment is limited on space in the kitchen and raw foods and RTE foods must be prepped on the same table, RTE foods should be prepped first. The area and equipment used to prep RTE foods must be cleaned and sanitized, and then the food handler may use the same area to prep raw food items. Foodservice establishments may also assign specific pieces of equipment or color coded equipment to prepare only raw foods or only RTE foods with. Manufacturers produce colored cutting boards so foodservice establishments may use red for prepping red meats, yellow for prepping poultry, and green for prepping vegetables or fruits. Even though this may help food handlers use only particular equipment for preparation of particular food items, this does not prevent cross-contamination from occurring due to the microorganisms that lie on the surfaces from where the foods were prepped. Food handlers still need to follow proper practices of cleaning then sanitizing the surface after they finish food preparation (NRAEF, 2004).

### **2.5.3 Storage of Food**

Different food items must be stored in a particular order in walk-in refrigeration units or stand-up refrigeration units in the kitchen. Food handlers must be aware of where they are placing particular food items when storing them in the refrigerator. There are two different types of bacteria that are found in refrigerated foods. Pathogenic bacteria induce food borne illnesses and spoilage bacteria cause food to deteriorate and develop bad odors, tastes, and textures (USDA, 2010). Due to pathogenic bacteria in food, food items must be placed in the refrigeration unit in a particular order. Food handlers must store cooked or RTE foods above raw meat, poultry, and fish if these items are stored in the same unit (NRAEF, 2004). Cooked and RTE food items are stored above raw items to prevent cross-contamination of indirect food-contact if in the instance that the raw items potentially drip. Raw meat, poultry, and fish should be stored in the following top-to-bottom order in the refrigeration unit: Whole, fish, whole cuts of beef and pork, ground meats and fish, whole and group poultry (NRAEF, 2004). Foods are stored in this top-to-bottom order since it is based on the minimum internal cooking time of these foods.

### **2.5.4 Knowledge, Attitudes and Practices (KAP) on Food Safety and Food-borne Diseases**

A study to assess knowledge, attitudes, and behavior concerning food-borne diseases and food safety issues amongst formal food handlers conducted in Italy found that the majority of food handlers who had attended a training course had knowledge and a positive attitude toward food-borne diseases control and preventive measures (Angelillo *et al.*, 2000). The positive attitude was not supported when asked about self-reported behaviours and when observed during food preparation for practice of hygienic principles. This was on the basis that only 21% used gloves when touching raw,

unwrapped food. Predictors of the use of gloves were educational level and attending training courses. The authors suggested that emphasis should continue on improving knowledge and control of food-borne diseases amongst food handlers (Angelillo *et al.*, 2000).

In Malawi, a study on the KAP on food hygiene of caregivers also showed a poor relation between knowledge, behavioural and sanitary practices, as swabs from caregivers' hands and food tested positive for coliforms and *E Coli*. (Kalua, 2002).

Furthermore in a study conducted in Mauritius on 50 street food vendors, it was reported that despite the efforts of Health Inspectors in promoting the risks of poor hygiene practices, and an awareness of hygienic conditions, the majority were not putting their knowledge into practice as they perceived their products to be of low risk. (Subratty *et al.*, 2004). The authors attributed this to lack of knowledge and recommended a need to strengthen the educational programme (Subratty *et al.*, 2004).

Mukhola (1998) in assessing the factors influencing the safety and quality of street food in a rural area in Limpopo examined the knowledge, attitude and perceptions in both street food vendors and consumers. Her findings indicated that the majority of street food vendors and consumers had little information regarding the proper preparation and storage of food as well as environmental conditions that may be detrimental to health. Furthermore 64.4% of consumers thought that street food is sold under unacceptable conditions and these needed improvement (Mukhola, 1998). Based on the literature reviewed, many of the studies have been conducted on the formal sector; there is limited information on the effectiveness of training conducted on handlers of the School Feeding Programme. It is therefore very important to explore the KAP of these food handlers of the School Feeding Programme in order to allow for a better understanding of these variables in relation to food safety.

# KNUST



## CHAPTER THREE (3)

### METHODOLOGY

#### 3.0 Introduction

This chapter describes the research methodology. It comprises the study design chosen; definition of terms; the study population; sampling; data collection techniques and tools; validity and reliability; data analysis; study limitations and the ethical considerations regarding the study.

#### 3.1 Setting

Tamale is the capital town of the Northern Region, one of ten in Ghana. It is located within the Guinea Savannah belt and is the fourth largest city with a population of 537,986 inhabitants according to the 2012 census and with a growth rate of 3.5%. The size of Tamale is approximately 922 km sq. There are three sub-metropolises within the Tamale Metropolis. These are; Tamale Central, Tamale South and Tamale North. It's the fastest growing city in West Africa (<http://www.ghanadistricts.com>). The town is located 600 km north of Accra-the capital town of Ghana. Tamale residents are moderate followers of Islam, as reflected by the multitude of mosques in Tamale, most notably the Central Mosque.

The metropolis experiences one rainy season from April to September or October with a peak in July and August. The mean annual rainfall is 1100 mm within 95 days of rainfall in the form of tropical showers. Consequently, staple crop farming is highly restricted by the short rain season.

The city experiences severe harmattan winds in the dry season from November to January. The Metropolis is poorly endowed with water bodies. The only water systems are a few seasonal streams, which dry up during the dry season. The other water bodies

include dugouts and dams. The city attracts population from all over the northern region. Economic activities revolve around farming and trading. According to the 4<sup>th</sup> Ghana Living Standard Survey (GLSS), the northern region is one of the three poorest regions in the country. Many International Non-Governmental Organizations operate in the northern region but few of them work in Tamale. Tamale is the principal center of education in North Ghana. Currently there are a total of 742 basic schools within the metropolis. This comprises 94 kindergartens, 304 primary schools, 112 Junior High and 10 Senior High Schools. The rest are technical/vocational institutions, two (2) colleges of Education, a polytechnic and two universities –one public and the other private.

### **3.2 Study Design**

A descriptive study design utilizing a quantitative method to describe the food safety knowledge, attitudes and practices of caterers and cooks is employed. This design is chosen because it would provide information on the knowledge and attitudes and practices of the study subjects. It makes the collection of information relatively inexpensive and can be used in a short time.

### **3.3 Definition of Terms**

**Certified:** Cooks and caterers who are regulated, i.e. they comply with Food Safety Regulations relating to food premises and have been issued a Certificate of Acceptability.

**Certificate of Acceptability:** Certification issued to owners of premises on which food is to be handled.

**Food and Drugs Authority (FDA):** An organization under the Ministry of Health made up of trained professionals, competent to design and enforces food safety legislation in Ghana. For law enforcement, they are authorized as Inspectors. In other countries the terms Environmental Health Officers (EHOs) or Health Inspectors may also be used.

**Five (5) Keys to Safer Foods:** Essential food safety messages or principles linked to behaviours that, if adopted and practiced, will reduce the probability of food-borne illness.

**Food Safety:** The assurance that food will not cause harm to the consumer when it is prepared and/or eaten in a hygienic manner.

**Food Hygiene:** All conditions and measures necessary to ensure the safety and suitability of food at all stages of the food chain.

**Food Caterer:** A person involved in professional food preparation, distribution or selling thereof in the mainstream sector e.g. restaurants, hospitals, schools, catering establishments, food factories etc.

**HACCP approach:** Food Safety Management plan that utilizes an assessment of Hazards, analysis and identification and implementation of Critical Control Points.

**Potable water:** Water that is considered suitable for human consumption (drinkable) according to the WHO Drinking water Guidelines, 2006.

**Registered cooks:** Informal cooks who are legally operating by complying with regulations.

**School Feeding:** An intervention programme that requires food to be prepared and served by caterers and cooks to school pupils in schools.

### **3.4 Study Participants**

The study involved all caterers and cooks of the sampled School Feeding Programme schools in the Tamale Metropolis. Also, head teachers and teachers in charge of supervision of feeding the pupils were part of the study. The schools sampled for the research are Kotingli Presbyterian Primary, Sakasaka Nurul Islam Primary, Zogbeli Ansuaria Primary and Ibini Tamiya T. I Ahmadiya Primary schools.

### 3.5 Sample Size

The number of School Feeding Schools sampled for this study is ten (10). One caterer is assigned to two schools but the number of cooks varied. All the caterers and cooks in the sampled schools were included in the research. For the purpose of the research, the pupils were not direct participants in the study. However, all of them were observed during serving and eating of the meals so as to take particular notice of the conditions of hygiene and safety of the bowls they ate from as well as that of the environment.

**Table 3.1: Distribution of Respondents**

School	No. of cooks	No. of caterers	No. of Supervisors	Enrolment	Location
SakasakaNurulIsl	2	2	1	215	Tamale North Sub-metro
Ibini Tamiya T. I	4		1	223	
Yong Duuni Prima	2		1	242	
KotingliPresby	3	2	1	208	Tamale South Sub-metro
Sognayili L/A	3		1	198	
Suabiriyya E/A	2		1	115	
Katariga Primary	3		1	105	
Sorugu L/APrimary	2	1	1	202	Tamale Central Sub-metro
SalambaZion Prima	3		1	114	
ZogbeliAnsuariya	4		1	328	
<b>TOTAL</b>	<b>A=28</b>	<b>B=5</b>	<b>C=7</b>	<b>D=1850</b>	

**Source: SFP Secretariat, N/R (2013)**

In all, twenty five (25) cooks and five (5) caterers were direct participants with 1850 pupils observed. The teachers in charge of supervising the feeding of pupils in the schools were also interviewed to get an impression about their knowledge, attitude and practices as well as those of the cooks and caterers. Thus the total number of direct participants is  $A+B+C=40$  as shown in the table 3.1.

### **3.6 Sampling Procedure**

The list of schools that are beneficiaries of the School Feeding Programme was obtained from the Metropolitan Secretariat of the School Feeding Programme. The schools were divided into three strata according to the three sub-metropolises using stratified sampling. Simple random sampling was used to select the study schools from each stratum. In order to randomly obtain the schools from the three sub-metropolises, the names of the schools were written on individual pieces of paper. The papers were folded and shaken in a container. Thereafter, four (4) papers were drawn from those of Tamale South, and three each from those of Tamale North and Central. Thus four schools were chosen from Tamale South Sub-metropolis and three schools each from Tamale North and South Sub-metropolis because the South Submetropolis had more schools benefiting from the programme.

All the cooks, caterers and supervisors in the sampled schools were participants in the study because they are handlers of food and should have knowledge about food safety, environmental and personal hygiene, kitchen hygiene, food storage and safety practices. Purposive sampling was therefore used to select the teachers in charge of school feeding as well as cooks and caterers in the sampled schools upon visit to those schools. In all, forty (40) respondents participated in the research as shown in table

3.1.

### **3.7 Data Collection Methods and Tools**

The knowledge, attitudes and practices of caterers and cooks regarding food safety was determined by means of a face to face interview utilizing a semi-structured questionnaire. Two methods of data collection were used:

#### ***1. Interviews with caterers and cooks to collect data on knowledge and attitudes***

Face to face interviews utilizing trained interviewers were carried out from 5<sup>th</sup> November to 25<sup>th</sup> December, 2013 utilizing a standardized questionnaire. Interviews were conducted in English and Dagbani. The questionnaire was divided into seven sections and comprised 115 questions. Data collected included general information such as demographic characteristics of respondents, training and related information; knowledge, attitude and practices to the tenants of food safety (environmental and personal hygiene, kitchen hygiene, food storage and hygiene practices). Possible answers were listed, e.g. Yes, No; True, False; Agree, Disagree etc and interviewers were required to circle the correct response (Appendices B, C & D)

Caterers, cooks and supervisors were interviewed at their schools and the questionnaire took about 45 minutes to complete. The option to use a structured face to face interview approach as opposed to telephone or mailed interviews was seen as the most feasible given that a higher response is guaranteed, literacy levels are not called into question, and clarifications can be done as necessary. This method does however have its shortcomings in that it is time consuming, costly and anonymity is not assured particularly if respondents are not comfortable with such techniques. In order to reduce bias and ensure accuracy, interviews were conducted by trained persons who were not associated with the School Feeding Programme.

**2. Observations to collect data on food hygiene and safety related practices** Data on availability of equipment for hygienic practices was collected from all sampled schools using an observation checklist. Seventeen critical elements to food safety and hygiene were listed on the observation checklist that formed the last part of the questionnaire. The interviewers had to assess if the equipment was available, e.g. a bowl or bucket or sinks for washing hands, soap, clean drying cloths etc. If these were available the answer, “Yes” was circled and if

not available, “No” was circled. Observations have limitations in that they are subjective. In order to address this, observations of equipment available were collected by interviewers trained in food hygiene. This would then be used to conclude that if a water bucket and soap were available, then hand washing was done. Actual observation of food preparation would be done to confirm whether the knowledge and attitudes expressed in the responses were in reality put into practice.

### **3.8 Tool Development**

Due to the fact that not much research has been done in this aspect, the data collection tool had to be developed and training materials used by the School Feeding Programme were used as a basis to develop some of the questions. A tool developed by the WHO for the evaluation of food safety knowledge was adapted for this purpose. Information from questionnaires used in documented studies on the formal sector was also utilized as well as general information in the literature review to formulate the questions.

The Questionnaire comprised questions to obtain information on demographical data of participants such as age, level of education, history of training; information on food hygiene and safety, buying and storing food, attitudes towards food safety and hygiene principles. To assess knowledge questions, a modified 3-point Likert scale was used ranging from agree to disagree and not sure.

Data on the practices of cooks and caterers were obtained through questions on how they handle foods, prevent cross contamination and the checklist to observe the cleanliness of the working area and the personal hygiene of the cooks and caterers.

The attitudes statements were allowed for yes/no or true/false answers.

### **3.8.1 Validity and Reliability of the Tool**

Validity describes the properties of tests and measures. A test or measure is valid if the inferences made from it are appropriate, meaningful and useful.

To ensure validity, the tool was critiqued by experts in the Department of Food Science of the Kwame Nkrumah University of Science and Technology (KNUST), in particular the supervisor who reviewed the instrument.

To further assess the applicability of the tool to the local setting, a pilot study was carried out to verify clarity; understanding of the questionnaire and to determine the amount of time required to complete the questionnaire.

### **3.8.2 Testing the Questionnaire**

A pilot was conducted amongst ten randomly selected street food vendors in the Tamale North Sub-metropolitan area. Minor adjustments were made to some of the questions for clarity and to improve understanding. The questionnaire took about 30 minutes to complete. This took longer than the administration of the questionnaire by the interviewers as validity of the questionnaire was checked.

A training session for the interviewers was held in November, 2013. Topics covered included the rationale for the research, how it would assist the cooks and caterers, the feedback process and the need for confidentiality. This was followed by an in-depth review of the questionnaire with role plays to allow for clarification on any of the questions. All interviews were conducted from the 5th of November to the 5th of December, 2013.

### **3.8.3 Data Management and Processing.**

Questionnaires were checked thoroughly to ensure all responses were provided before data entry, and during the data collection.

The completed data was entered into SPSS version 20 for analysis. Data cleaning and sample duplicate entry was used to ensure data quality due to possible capturing errors. All numerical data was analyzed using descriptive statistics and will be presented in chapter four.

#### **3.8.4 Statistical Analysis**

The knowledge section (part 1) included 30 close-ended questions with three possible answers. Each question was responded to by all the forty (40) respondents. For evaluation, a scale ranging between 0 and 40 points was used. Any questions with scores less than 20 of the respondents correctly responding (ie total correct responses for that question is  $< 20$ ), the respondents were regarded to have “insufficient” knowledge with respect to that question. On the other hand, those questions that had scores greater than or equals 20 correct responses (ie total correct responses for that question is  $\geq 20$ ) the respondents were considered to have “sufficient” knowledge with respect to those questions. Thus the cut-off point for the analysis of the results was lower than that reported in other studies (Lilian *et al.*, 2012) because the responses are recorded with respect to each question unlike Lilian *et al.*, (2012) who recorded their responses with respect to all the questions. Also, there was no prior knowledge about respondents’ food safety training background.

The attitudes section of the questionnaire (part 2) aimed to determine the understanding of the respondents about food safety and contained 15 behaviour statements that required two levels of answers, “true”, and “false” each statement to be responded to by all the forty (40) participants. A “positive” attitude was considered with respect to behaviour when 35 or more ( $\geq 35$ ) respondents responded “true” to it if it has favourable outcome for food safety or “false” to a behavior which has a negative impact on food safety. A negative attitude was considered when 34 or fewer

( $\leq 34$ ) respondents responded otherwise.

In section 3, the food safety practices of cooks, caterers and their supervisors were evaluated and assessed through self-reporting on personal hygiene and related food handling procedures. There were 14 practice statements with two levels of answers, “yes” and “no” each to be responded to by all the forty (40) participants. A “good” hygienic practice towards food safety was considered with respect to a practice when 35 or more ( $\geq 35$ ) respondents responded “yes” to it and it has favourable outcome for food safety or “no” to a practice which has a negative impact on food safety. A “poor” food hygienic practice towards food safety was considered when 34 or fewer ( $\leq 34$ ) respondents responded otherwise.

For the purpose of determining the knowledge, attitudes and practice of the different categories of respondents (cooks, caterers and supervisors), cut off points were established for each category:

- i) Cooks (0-28); ( $\geq 20$  was considered positive attitude and  $\leq 19$  for negative attitude),
- ii) Supervisors (0-7); ( $\geq 5$  was considered positive attitude and  $\leq 4$  for negative attitude),
- iii) Caterers (0-5); ( $\geq 4$  was considered positive attitude and  $\leq 3$  was considered negative attitude).

Also, to determine the relationship between some of the demographic characteristics and the knowledge, attitude and practices, the following cut offs were used:

Work Experience: 1-2yrs ( $\geq 15$  for 21 respondents); 3-4yrs ( $\geq 8$  for 13 respondents); 5-6yrs ( $\geq 3$  for 4 respondents); > 10yrs ( $\geq 1$  for 2 respondents)

Training: Trained ( $\geq 5$  for 8 respondents); Untrained ( $\geq 25$  for 32 respondents) A chi-square analysis was done to determine the significant relationship between some of the

demographic parameters (educational level, job position, food safety training, and work experience) and the level of food safety (knowledge, attitude and practices) of the cooks, caterers and supervisors. A p-value less than 0.05 ( $p < 0.05$ ) was considered a significant.

Also, the frequencies and the percentage scores of the respondents for each of food safety knowledge, attitude and practice according to educational level, work experience, food safety training, and job position were determined using SPSS. The scores were presented using pie and bar charts for easy appreciation.

### **3.9 Response Rate**

The response rate was 100%. All the participants cooperated with the interviewers even though one of them initially refused to participate when she was informed that the interview was meant to elicit responses from her with regards to knowledge, attitude and practices of food safety. It took the intervention of the caterer to convince her to participate.

## **CHAPTER FOUR (4)**

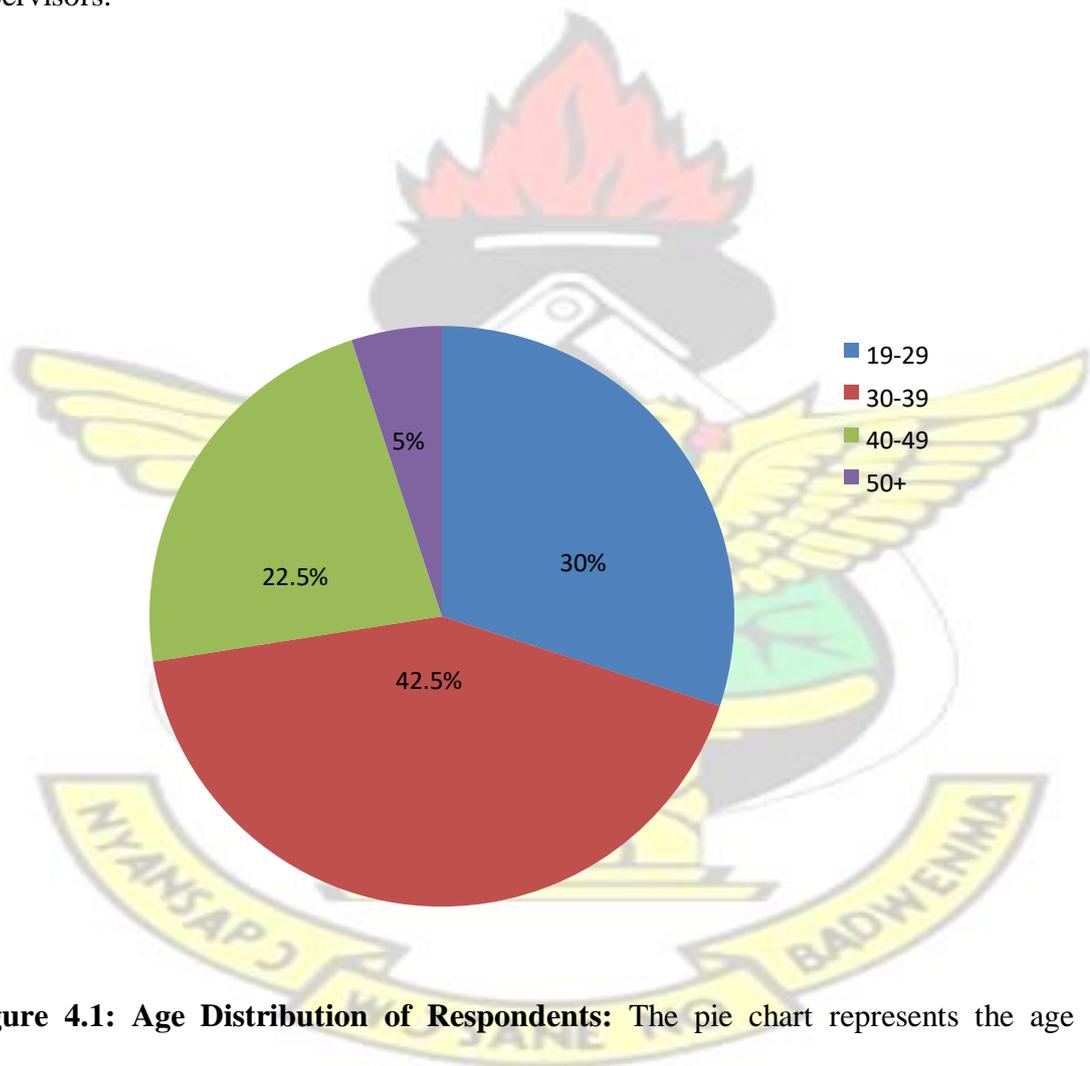
### **RESULTS AND DISCUSSION**

#### **4.0 Sex of Respondents**

From figure 4.3, out of the 40 participants in the study, only eight (8) were males representing 20% as against 32 females which represents 80%. This means that more females took part in the study than males. This is very significant in that it presupposes that the food preparation industry remains female dominated. In fact, the 8% males were all teachers whose role has no direct bearing on the food preparation but are in charge of supervising the eating session and are thus mainly tasked to ensure orderliness. No male caterer or cook was encountered during the study.

#### 4.1 Age Distribution of Respondents

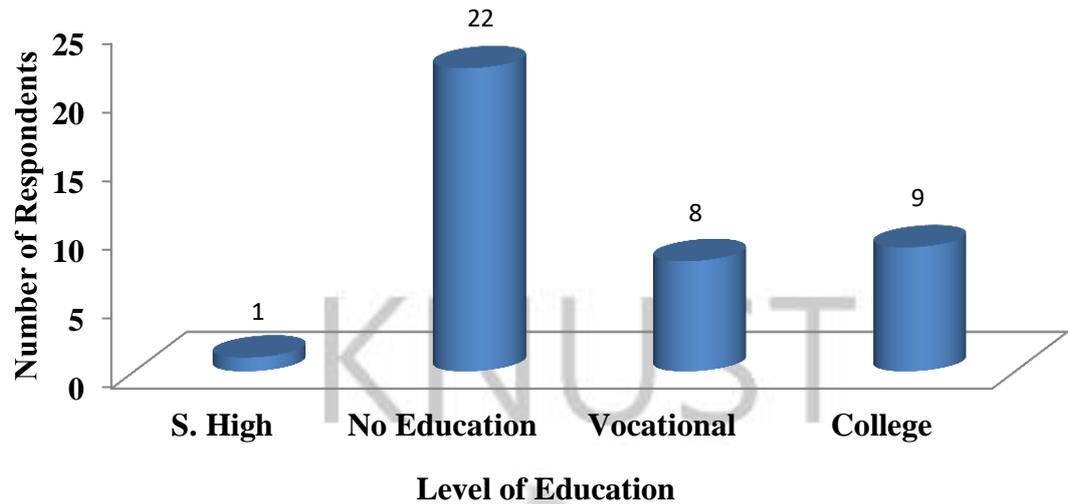
Of the 40 participants, 12 of them fall within the age category of 18 to 29 representing 30% and 17 (42.5%) fall within age category 30 to 39. A decline in the number of participants is observed as age increases. Age category 40 to 49 is 22.5% and only 2 participants are of age 50 to 60 representing 5%. It also implies that there are more young people than the old in the feeding programme working as cooks, caterers or supervisors.



**Figure 4.1: Age Distribution of Respondents:** The pie chart represents the age distribution of the respondents.

#### **4.2 Educational Level of Participants**

Of the 40 participants, 22 representing 55% had never been to school. Those who had vocational and some college education were 8 and 9 respectively, representing 20% and 22.5% respectively. Only one (2.5%) participant ended at the high school level. The impact of education on the quality and safety of food cannot be underestimated. Most of the uneducated employees were the cooks who are directly involved in the preparation and serving of the meals thus raising a serious concern about their ability to understand and implement food safety regulations. Some of the caterers are not also educated. Since they are the direct supervisors of the meals prepared, the lack of formal education could affect their effectiveness in doing due diligence not only during the meal preparation but also during the purchase of food stuffs so as to safeguard the meals. All the teachers put in charge to monitor and supervise the pupils to feed had at least Senior High education since it is a prerequisite for employment as a classroom teacher. They however do not interfere with the food preparation process but only ensure that the pupils eat the food in an orderly manner. Therefore their knowledge on food safety may not directly impact on the meals. The dominance of uneducated employees among the cooks and caterers in the feeding programme could compromise the standards of food hygiene, food safety and sanitation practices. This is so because they might not be able to understand and implement basic international best practices in food safety and hygiene. This result also attests to the high level of illiteracy among women in Ghana, particularly in the northern region.



**Figure 4.2: Educational Level of Respondents:** The bars represent the number of respondents and the corresponding level of education.

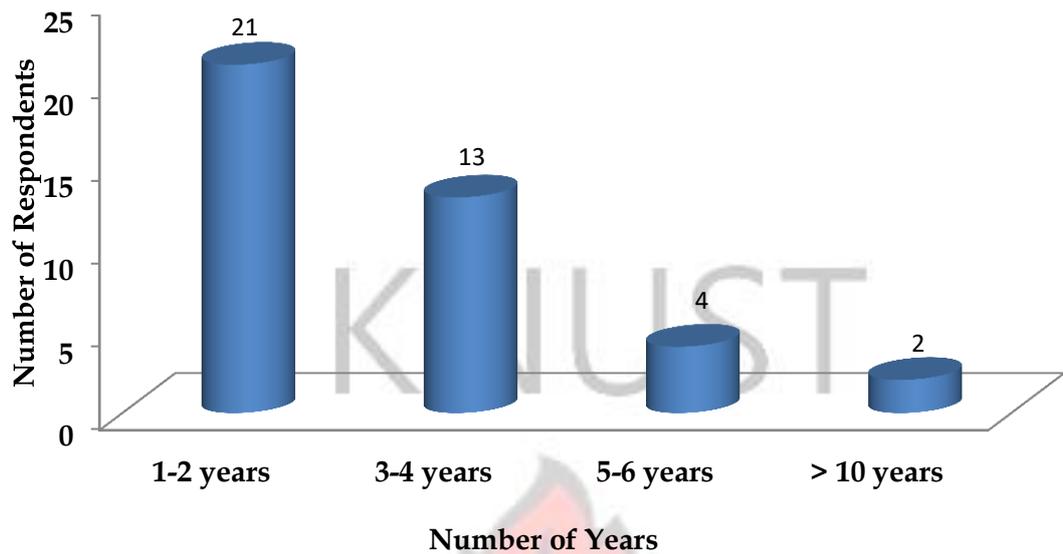
### 4.3 Job Position and Food Safety Background

The study comprised of participants belonging to three different job positions; caterers, cooks and supervisors (teachers who are assigned additional responsibility to supervise the pupils at meal times). In all 28 cooks representing 70%, 5 caterers representing 12.5% and 7 teachers representing 17.5%, were part of the study. Of all the participants, 7 representing 17.5% belonged to the permanent employment category, 28 representing 57.5% are on casual employment and 10 representing 25% are on contract. In fact, all the cooks are casually employed by the caterers, most of whom easily quit the job due to poor remuneration, as well as delay and irregular payment of allowances. This presupposes that the sector encounters frequent replacement of cooks, thus raising a serious concern about the lost of cooks who might have already received food safety training before recruitment or in the course of the job to those who do not have any such background.

All the caterers are employed on contract basis and are regarded the main employees of the Ghana School Feeding Programme. This makes them so powerful at the lowest level

of implementation. They virtually determine who should be employed as cook and have oversight responsibility over all the cooks. The purchase of food stuffs and other food ingredients are left to the discretion of the caterer. Even though the School Implementation Committee ought to have been involved in some of the critical decisions, it is dormant and everything is virtually left to the caterers to manage. The work experience of the participants in the food service sector varied. 21 of them representing 52.5% have worked for 1 to 2 years, 13 of them (32.5%) have been working for 3 to 4 years, 4 (10%) have 5 to 6 years' experience and only 2 of them (5%) have over 10 years working experience in the food service sector. 9 cooks and 5 caterers have worked as food vendors before they were casually or contractually employed by the school feeding programme.

With regards to food safety and training, 28 (70%) of the participants have never had any food safety education or training. Only 12 of them (30%) have gained food safety knowledge either through formal education or training by the Food and Drugs Authority but not the School Feeding Programme Secretariat. In spite of the large number of employees without any food safety education, only 8 of the participants (20%) received some training at the time of recruitment by some of the caterers who have up to some level of formal education and food safety training. The rest of the 32 participants (80%) did not receive any food safety education either before or at the time of recruitment.



**Figure 4.3: Work Experience of Participants:** The bars represent the number of workers who fall within each of the four durations of work experience.

#### 4.4 Knowledge of Food Handlers

Generally, the food handlers in the school feeding programme showed sufficient level of food safety knowledge. All the forty respondents responded to each of the thirty questions meant to determine their level of knowledge with respect to food preparation, contamination, hygiene, and poisoning. Eighteen of the questions (60%) recorded correct responses above the limit that correspond to “sufficient” food safety knowledge ( $\geq 20$  respondents). The question “which of these is a bad food storage practice” recorded 22 respondents correctly responding to it and it is the lowest limit score of 55%. The upper limit score recorded all forty (40) respondents responding correctly to the question “what is the commonly heard statement about food safety” with 100% score. All the other scores are therefore within the 55% and 100% limits.

**Table 4.1: Areas of Insufficient Knowledge of Food Safety**

Question	Correct Score	% Score
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1. Which is the greatest food safety problem?	14	35
2. The purpose of the HACCP system is	19	47.5#
3. After trimming raw meat on a cutting surface,	17	42.5
4. When washing your hands, you should rub	15	37.5
5. The best way to clean your hands before preparing food is to:	19	47.5#
6. Using the same cutting board to cut up raw meat and then cut raw vegetables is safe as long as you wipe the board off with a clean cloth between the different foods.	13	32.5#
7. If you use a dishcloth to wipe up liquid from meat, oil or soup, you	9	
8. It is safe to use raw eggs in recipes that will not be cooked.	12	22.
9. Cooked rice at room temperature for more than 4 hours	18	30 45
10. Cooked meat at room temperature for more	13	32.5#
11. Which of the following powers does FDA Officers NOT have?	4	10*
12. How many times can you reheat leftovers?	16	40

\*lowest score; # Equal scores; < 20 correct responses is “insufficient” knowledge

Table 4.1 shows food safety knowledge questions to which respondents showed insufficient knowledge.

However, the rest of the 12 questions (40%) recorded correct responses by less than twenty respondents ( $\leq 19$ ). Therefore the food handlers have insufficient knowledge with respect to these questions as shown in table 4.1.

#### 4.5 Attitude of Food Handlers

The food handlers in the Ghana School Feeding Programme have demonstrated very high positive attitude towards food safety. All the forty respondents responded to each of the fifteen food safety statements meant to determine their behavior with respect to safe food preparation. At least 35 food handlers responded correctly to thirteen (13) of the statements, representing 86.7%, indicating very high “positive” attitude towards

food safety (ie  $\geq 35$  respondents). The statements about reheating leftover thoroughly, insects transmit food pathogens and unhygienic food handlers contaminate food with pathogens recorded the upper limit of 100% correct responses (ie all forty respondents responded correctly to the statements). This indicates that the food handlers' attitude is positive towards food contamination and one statement recorded a lower limit of 92.5%. The rest of the nine (9) statements have scores falling within the 92.5% and 100% limits. However, two statements representing 13.3% recorded far less than the  $\geq 35$  limit. These statements "The correct method for thawing frozen meat or broiler is to keep them overnight at room temperature" and "Food-borne pathogens can be seen by the eye" recorded correct responses by only 2 and 19 respondents respectively. This poor attitude of food handlers in cold food storage and microbial food contamination poses serious hazards to the safety of the food. The scores by statements are shown by table 4.2.

#### 4.6 Food Safety Practice of Food Handlers

The food safety practice of the food handlers in the school feeding programme is very good in respect of ten of the fourteen (14) food practice statements they responded to (86.7%). These ten statements have scores  $\geq 35$ ; the limit scores for any of the statements to be considered as being of "good" practice. Two statements (5 and 12) obtained the lower limit score of exactly 35 correct responses representing 87.5% **Table**

#### 4.2: Scores of Food Safety Attitude Statement

Attitude Statement	Correct Score	% Score
1. Causes of food poisoning by pathogens	39	97.5
2. Risk of eating raw or half cooked food	39	97.5
3. Unhygienic food handlers cause contamination with pathogens	40	100
4. Covered left overs of food for 6 hrs. cause food poisoning reheat leftover thoroughly	39	97.5
5. Refrigeration prevents food poisoning	39	97.5

6. Bare hands contaminate food with pathogens	38	95
7. Eating raw unwashed vegetables is risky	38	95
8. Correct method of thawing frozen meat	19*	47.5
9. Food poisoning because hospitalization and death	39	97.5
10. Healthy food handlers carry pathogens	39	97.5
11. Insects transmit food pathogens	40	100
12. Bacteria multiply quickly at room temperature	37	92.5
13. Food-borne pathogens can be seen by the eye	2*	5
14. Place vegetables higher than meat in fridge	38	95
15. Reheat leftover thoroughly	40	100

\* Poor attitude statements

Table 4.2 presents the food safety attitude questions. Respondents showed poor attitude to those with asterisk (\*)

while the upper limit scores are obtained by two (2) of the food safety statements (6 and 9) with a score of 38 correct responses representing 97.5%. The rest of the statements obtained correct responses that fall within these limits of 87.5% and 97.5%. However, the food handlers fared poorly in respect of four practice statements (10%) with each scoring  $\leq 34$  correct responses. The lowest score is statement one (1) which recorded 22 correct responses (55%) and the upper limit within this category of “poor” food safety practice is statement 4 with 33 correct responses (82.5%). The poor practices are with respect to washing of hands before handling food, working when having diarrhoea, keeping cooked meat at room temperature for more than four hours, and cooking when you having a condition of cold. These are critical to the safety of food as such, the food handlers’ food handling behaviour impacts negatively on the safety of the food. This supports the finding by Chapman *et al.*, (2010) that food handlers’ practices should be improved using food information sheet.

The rest of the statements, 8 and 10 fall within these limits of poor food safety practices. Table 4.3 below shows the scores for both the good practice statements and the poor practiced statements.

**Table 4.3: Scores for Food Safety Practice Statements**

Food Safety Practice Statement	Correct Score	% Score
1. Do you wash your hands before handling food?	22*	55
2. Do you wash your hands with water and soap?	38	95
3. Hand washing after using the bathroom?	38	95
4. Work when you have diarrhoea?	33*	82.5
5. Work with lesions on your hands?	35	87.5
6. Allow finger nails to grow?	39	97.5
7. Slice vegetables and fruits after washing?	38	95
8. Keep cooked meat at room temperature for > 4 hours?	12*	3
9. Clean contact surface before and after preparing food? Work when you have cold?	39	97.5
11. Wash vegetables and fruits before eating?	37	92.5
12. Wash hands with water and soap before eating?	35	87.5
13. Wash hands with water and soap after handling raw meat?	38	95
14. Wash hands with water and soap before serving meals?	37	92.5
10.	31*	77.5

\*Bad Food Safety Practices: Scores  $\leq 34$  Good Food Safety Practices: Scores  $\geq 35$

#### 4.7 Relationship between Education, Food Safety Knowledge, Attitude and Practice

##### 4.7.1 Knowledge and education

The majority of the respondents had sufficient food safety knowledge (86.4%). An analysis of the relationship between education and food safety knowledge revealed that hand drying, cutting surface hygiene, raw eggs safety, and powers of FDA had statistically significant relationship with education with  $\chi^2$  and p-values of 13.140; 0.004, 8.365; 0.039, 17.983; 0.006 and 9.795; 0.020 respectively. These aspects of food safety knowledge necessarily require food handlers to have some level of formal education to understand and practice them. It therefore indicates that educational background of food handlers is vital to the overall food safety knowledge, attitude and practice. However, there was insignificant relationship between education and all other food safety statements that assessed the knowledge of cooks, caterers and supervisors of the school feeding programme. This is shown in table 4.4.

**Table 4.4: Food Safety Knowledge and Education**

Food Safety Statement	values	%Score	$\chi^2$	p-value
1.hand drying		55	13.140	0.004
2. cutting surface hygiene		47.5	8.365	0.039
3. raw eggs safety,		30	17.983	0.006
4. powers of FDA		10	9.795	0.020

p-value< 0.05 means the knowledge statements are significantly related to education

#### 4.7.2 Education and Attitude

The respondents showed positive response with regards to attitude towards food safety except for correct method for thawing frozen meat or broiler, and Food-borne pathogens can be seen by the eye where respondents showed negative attitude with 5% and 47.5% correct scores respectively. However, none of the statements showed statistically significant relationship with education (p-value<0.05); the limit set statistical significance.

#### 4.7.3 Education and Practice

In the case of food safety practice, all the respondents showed good practice towards food safety with a least score of 70% and a high score of 97.5%. However, only the responses to the statement “Do you keep cooked meat or chicken at room temperature for more than 4 hours” showed statistically significant relationship with education with a  $\chi^2$  value of 10.725 and a p-value of 0.013.

### 4.8 Relationship between Job Position, Food Safety Knowledge, Attitude and Practice

#### 4.8.1 Job Position and Food Safety Knowledge

Of the thirty (30) food safety questions, 75% to 100% of the cooks showed good knowledge with respect to half of them (15 questions) with  $\geq 20$  of them providing correct response for these set of knowledge questions. They showed poor knowledge about the rest of the questions as 7.14% to 64.28% of them responded correctly to them.

The caterers on the other hand showed highest level of good knowledge with regards to food safety because  $\geq 3$  of them correctly answered 75% of the questions correctly.

For the supervisors, 16 of the questions (53.3%) were correctly answered by  $\geq 5$  (71.4% to 100%) of them. All the three categories of respondents however showed very poor knowledge about the powers of the Food and Drugs Authority, drying dishes after washing, as well as food safety problem.

With regards to statistical significance, responses to eight of the questions showed significant relationships with job position with p-values of  $< 0.05$  and chi-square as shown table 4.5.

#### 4.8.2 Job position and Attitude

The cooks in the study showed very high positive attitude with respect to 13 out of the 15 attitude statements with 90% to 100% of them correctly responding to them. Similarly, 90% to 100% of the caterers responded correctly to 12 out of the fifteen attitude statements. All the supervisors showed high positive attitude with respect to all the statements with 90% to 100% of them ( $\geq 6$  supervisors) responding correctly to the statements.

**Table 4.5: Job Position and Food Safety Knowledge**

Food safety question	$\chi^2$	p-value
1.Hans drying	5.599	0.06
2. Items to sanitize	4.835	0.089
3. Personal hygiene	4.835	0.083
4. Hand sanitation	11.930	0.003
5. Cooked rice Storage	15.384	0.004
6. Cooked meat Storage	12.444	0.014
7. Apple Storage	16.706	0.002
8. Bread Storage at room temperature	10.790	0.029

p-value  $< 0.05$  means the knowledge statements are significantly related to job position

However, both cooks and caterers demonstrated very high negative attitude to the statements “The correct method of thawing frozen meat is to keep them overnight at room temperature” and “food-borne pathogens can be seen with the naked eye” with zero and 2; 10 and 3 correct responses respectively.

In terms of statistical significant relationships between job position and the attitude statements, eight of the statements had statistically significant relationship with job positions with p-values < 0.05 as shown in table 4.6.

**Table 4.6: Practice Statements Significantly Related to Job Position**

Food safety statement	$\chi^2$	p-value
1. Risk of eating raw or half cooked food	4.835	0.089
2. Covered left overs of food for 6hrs cause FP	4.835	0.089
3. Refrigeration prevents food poisoning	7.179	0.028
4. Bare hands contaminate food with pathogens	6.979	0.031
5. Correct method of thawing frozen meat	14.737	0.001
6. Healthy food handlers carry pathogens	7.179	0.028
7. Food-borne pathogens can be seen by the eye	5.972	0.050
8. Place vegetables higher than meat in fridge	14.737	0.001

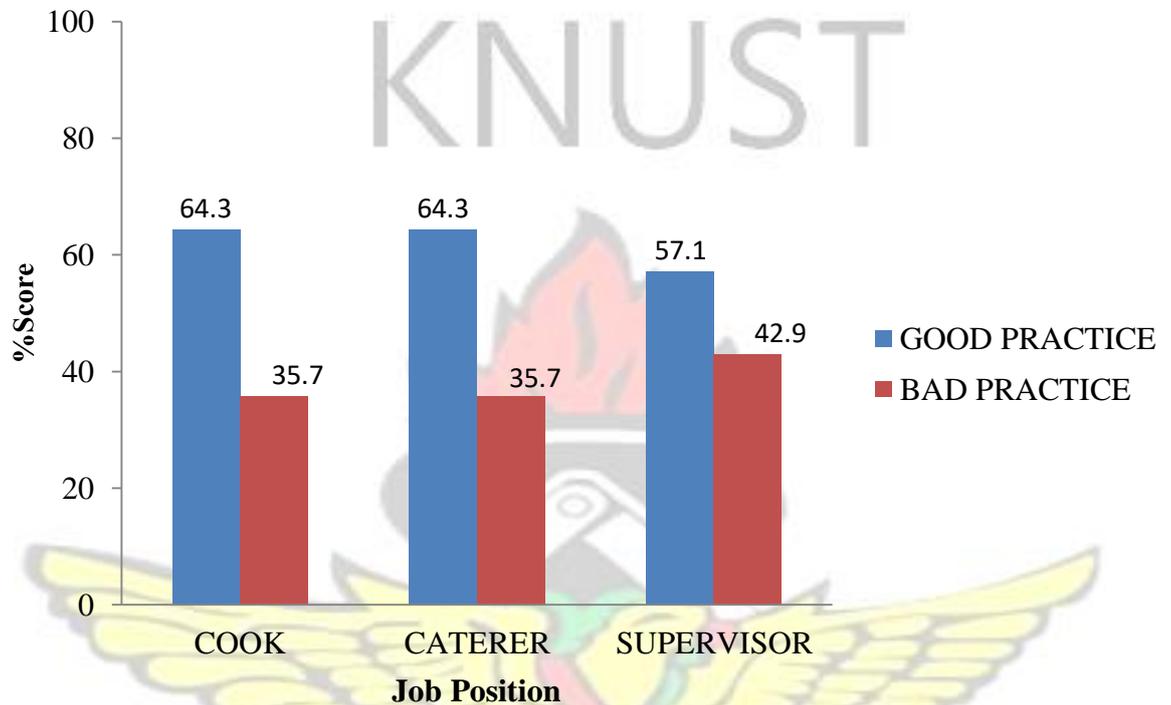
p-value < 0.05 means the practice statements are significantly related to job position

#### 4.8.3 Job Position and Food safety Practice

Generally, the food handlers of the school feeding programme have shown very good food safety practice. Out of the 14 food practice statements,  $\geq 20$  of the cooks and  $\geq 4$  of the caterers responded correctly to nine (9) of the statements representing 64.3%.

On the other hand,  $\geq 6$  of the supervisors responded correctly to eight (8) of the practice statements representing 57.1% of the practice statements. In terms of statistical relationship between job position and food safety practices, only two of the food safety statements were statistically significant with the position of the food handlers. These

questions; “Do you wash vegetables and fruits before slicing them” and “Do you keep cooked meat or chicken at room temperature for more than 4 hours” both had  $\chi^2$  and p-values of 6.979; 0.031 which is less than the  $p < 0.05$  for statistical significance. Figure 4.4 below is an illustration of the score by job position of the food handlers.



**Figure 4.4: Job Position and Food Safety Practice.**

The bars represent the percentage scores of good and bad food safety practices by the cooks, caterers and supervisors.

#### **4.8.4 Work Experience and KA**

In terms of food safety knowledge, the cooks, caterers, and supervisors had insufficient knowledge with respect to four of the thirty questions representing 13.3%. Those with 1-2yrs, and 3-4yrs correctly responded to 16 and 12 of the knowledge questions with correct responses less than the  $\geq 15$  and  $\geq 8$  respectively. Those with 5-6yrs and  $\geq 10$ yrs also correctly responded to 12 and 10 knowledge questions by margins less than the cut off points of  $\geq 3$  and  $\geq 1$  respectively. They thus have insufficient knowledge with respect to all four statements. They however, have sufficient knowledge with respect to 36 of the questions, representing 96.7%. For statistical significance, five knowledge

questions showed significant relationship with experience and have p-values of less than 0.05 ( $p < 0.05$ ). These are shown in table 4.7.

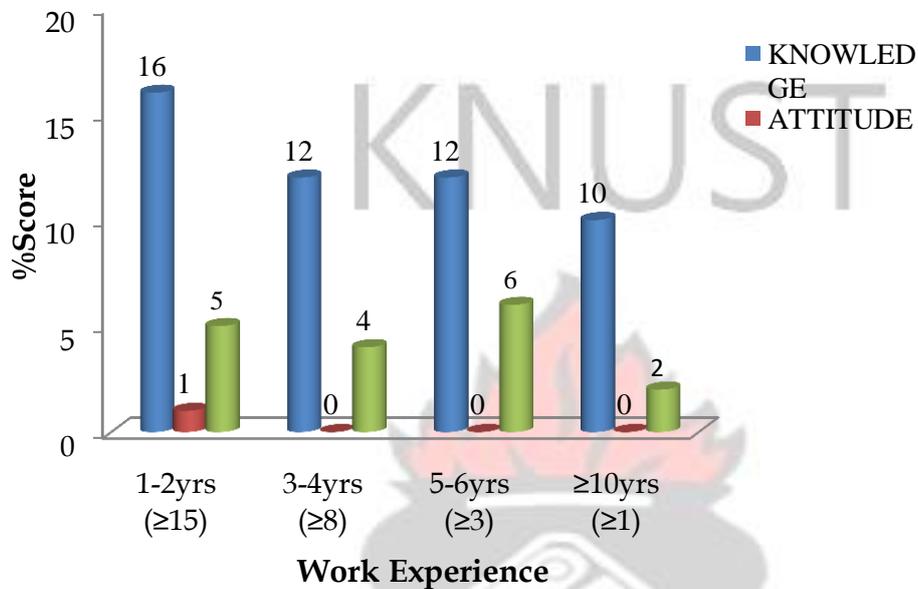
**Table 4.7: Work experience and knowledge**

Food safety statement	$\chi^2$	p-value
<b>1. Which is the greatest food safety problem?</b>	15.647	0.001
<b>2. When washing dishes, how should they be dried?</b>	17.67	0.01
<b>3. The best way to clean your hands before preparing food is to:</b>	12.385	0.006
<b>4. If you have diarrhea, it's okay to prepare food for others if you wash your hands first.</b>	12.373	0.054

**p-value < 0.05 means the knowledge statements are significantly related to work experience**

With respect to food safety attitude, all the respondents showed 100% positive attitude to all the statements by providing correct responses greater than or equal to the cut off points, except those with 1-2yrs of experience who showed negative attitude with respect to one statement by recording correct responses less than the cut off. Those with 1-2yrs of work experience showed poor attitude towards the statement, “Food-borne pathogens can be seen by the eye”. However, there is significant relationship between this statement and work experience with chi-square and p-values of 15.47; 0.001. All the others have no significant relationship with work experience. Also, all the respondents had very good food safety practice but the practice increases with experience. Those with 1-2yrs of experience poorly practice five of the statements, while those with 3-4yrs, 5-6yrs and  $\geq 10$  years of experience poorly practice 4, 6 and 2 statements of the questionnaire respectively. The first statement, “Do you wear gloves when you handle ready to eat food” showed statistical significant relationship with work experience with chi-square and p-values of 17.104; 0.001. The rest of the statements do

not have any significant relationship with work experience. Fig 4.5 below illustrates the insufficient knowledge, poor attitude and bad practices scores according to food handler's work experience.



**Figure 4.5: Work Experience and KAP.**

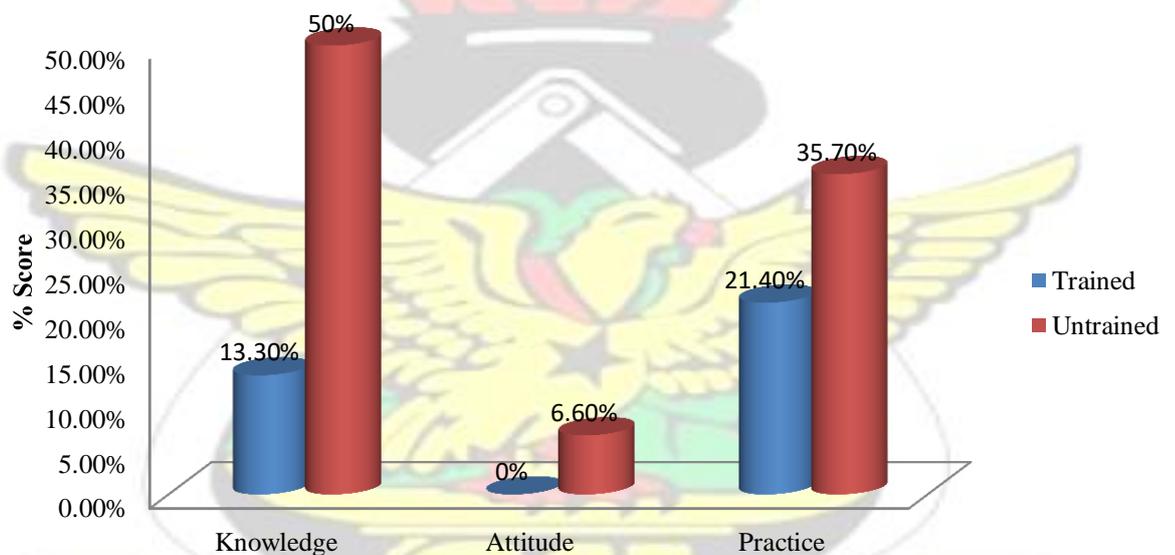
The bars represent the percentage scores of insufficient knowledge, poor attitude and bad practices according to the duration of work experience.

#### 4.8.5 Training and KAP

Food safety training has an impact on the knowledge, attitude and practices of the food handlers. Those who had food safety training background correctly responded to 66.7% of the questions on knowledge by  $\geq 5$  and are therefore deficient in knowledge with respect to 10 questions (33.3%). On the other hand, those who are untrained had insufficient knowledge with respect to fifteen (15) questions representing 50%; all of which recorded correct responses less than or equal to twenty four ( $\leq 24$ ). However, question 5 showed statistical significance relationship with training with a chi-square and p-values of 5.714; 0.017. With respect to attitude, all those with food safety training background had positive food safety attitude with respect to all the statements but

untrained staff have negative attitude with respect to one (1) statement. The attitude statement “Eating covered leftover cooked food, kept at room temperature for more than 6 hours, is at high risk to cause food poisoning” was statistically significant with training and so had a chi-square and p-values of 4.103; 0.043.

For food safety practice, respondents with food safety training background showed poor practices with respect to three statements (21.4%) while those without food safety training background are poor with respect to five statements (35.7%). Fig. 4.6 below shows the number of knowledge, attitude and practice statements in respect of which both trained and untrained respondents are deficient.



**Knowledge, Attitude and Practice of Food Handlers Figure**

#### **4.6: Training and KPA.**

The bars represent the percentage scores of insufficient knowledge, poor attitude and bad practices by trained and untrained food handlers.

# KNUST

## CHAPTER FIVE (5)

### 5.0 CONCLUSION AND RECOMMENDATIONS

#### 5.1 Conclusion

The results of the present study indicate that food handlers had sufficient food safety knowledge with an overall score of 64.7% of all the food safety knowledge questions they responded to. Despite this general score, the food handlers had insufficient food safety knowledge with regards to storage of food stuffs, food contamination, food and personal hygiene as well as handling of ready to eat food (cooked food).

In addition, the overall attitude of the food handlers was positive with an average score of 86.7%. However, their attitude was negative with respect to food contamination, and cold chain management (score of 6.6%) which are critical to food safety.

Also, the food handlers demonstrated very good food safety practices with an overall score of 71.4%. They however showed bad practices in handling and serving cooked food as well as food contamination (28.7%).

The study also revealed that food handlers had insufficient knowledge (13.3%) with respect to critical food safety issues (storage of food stuffs, food and personal hygiene,

food preparation and food contamination) but demonstrated positive attitudes for them. Again, their attitude with regards to personal and food hygiene, handling ready to eat food, and food contamination was positive but their corresponding practices were bad. This indicates that food handlers' practices (71.4%) are higher than their food safety knowledge (64.7%) and attitude (86.7%) do not translate directly into good food safety practices (71.4%).

## **5.2 Recommendations**

Food handlers of the School Feeding Programme should be given regular food safety education to equip them with the requisite food safety knowledge in all critical aspects of food safety. Particular emphasis must be on food storage, food hygiene, food contamination as well as food preparation.

In order to ensure improved food safety attitude, training courses should be organized regularly for food handlers of the feeding programme to enable them develop positive food safety attitude. Such training program should lay specific emphasis on food contamination, cold chain management and raw material handling. Caterers should be educated to understand the enormity of the food safety challenges that exist in the operations they supervise and the responsibility they have to feed pupils only with safe food.

In addition, the food safety practices of food handlers could be improved and sustained by designing an effective food safety system such as HACCP to suit implementation for the SFP. Such a system will enable food handlers to follow step by step all the safety procedures that will guarantee safety at critical control points in the food preparation process in order to guarantee overall food safety and curb any incidences of food-borne illness among beneficiary pupils.

The School Feeding Programme should as a matter of policy provide to all feeding schools the basic food safety facilities and equipment to promote food safety practices among food handlers.

Monitoring mechanisms should be put in place to ensure all food-handlers under the feeding programme follow all principles of food safety provided by the GSFP, the Ministry of Health and the FDA.

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## APPENDICES

### APPENDIX A

#### Questionnaire Designed For the Assessment of the Food Safety Knowledge of Food Handlers of the Ghana School Feeding Programme (GSFP)

##### Introduction

I am **ABDUL MALIK BAWAH**; an MSc Food Quality Management Student from the **KNUST**. As part of the requirement for this higher study, am conducting a study that seeks to assess the Food safety knowledge of food handlers (cooks, caterers and supervisors) of the Ghana School Feeding Programme. Your outfit has been sampled to participate in this purely academic research. Your input will help me achieve my desire to contribute to knowledge for the betterment of the feeding programme.

I would therefore be most grateful if you could kindly assist me complete the questionnaires below. You are however assured of your **anonymity** and **confidentiality** of your responses. I would be of assistance to you in case you need any clarification.

## APPENDIX B

### CATERERS AND COOKS DEMOGRAPHIC SURVEY

Please read each question and check the appropriate response.

1. What is your age? *Please check one.*

18 and under

19 – 29

30 – 39

40 – 49

50 and over

2. What is your gender? *Please check one.*

Female

Male

3. What is your level of education? *Please check all that apply.* high school

Vocational/technical school/trade school

Some college

Graduated college

Post-graduate degree

4. What is your job position? \_\_\_\_\_

5. How long have you been working in the foodservice industry? *Please check one.*

Less than 1 year

1- 2 years

3-4 years

5-6 years

7-10 years

More than 10 years

6. Have you completed any course and/or training in food safety and sanitation?

*Please check one.*

Yes

No

7. Have you completed any food Safety courses prior to your recruitment? *Please check one.*

Yes No

8. Which is your religion?

Christianity

Islam

Traditional

9. Are you a trained cook?  Yes  No

10. Under what type of employment do you work?

Casual worker

Permanent worker

Contract worker

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## APPENDIX C

### QUESTIONNAIRE ON FOOD SAFETY KNOWLEDGE

**For each question below, circle the answer that you think is best.**

1. Which is the greatest food safety problem?
  - A. pesticides
  - B. hair
  - C. microorganisms
2. Cross-contamination is most likely to occur when you A. Touches raw meat and then touch cooked or ready-to-eat food.
  - B. Checks the refrigerator temperature regularly.
  - C. Hold food at temperatures below 140°F.
3. Hands should be washed after which of these activities?
  - A. Touching your hair
  - B. Using a handkerchief
  - C. Both A and B
4. When putting on disposable gloves to handle food you should A. washes your hands and then put on gloves.
  - B. put on gloves and then washes your gloved hands.
  - C. put on gloves without washing your hands.
5. Which personal behavior can contaminate food?
  - A. Touching a pimple or sore
  - B. Coughing or sneezing on food
  - C. Both A and B
6. After washing your hands, dry them with A. Your apron.
  - B. A single-use paper towel.
  - C. A reusable cloth towel.
7. Which of these is a bad food storage practice?
  - A. rotating food to use the oldest food first
  - B. Covering and labeling food before storage
  - C. Storing raw meat above ready-to-eat food
8. After trimming raw meat on a cutting surface, A. Rinse the surface with water.

- B. Dry the surface with a paper towel.
- C. Clean and sanitize the cutting surface.
9. The purpose of the HACCP system is to A.  
Identify and control possible food safety hazards.
- B. Keep the kitchen pest-free.
- C. Identify faulty food preparation equipment.
10. After going to the restroom, you should A.  
Wash your hands.
- B. Comb your hair.
- C. Have a snack.
11. Which of these always needs to be both cleaned and sanitized?
- A. Walls
- B. Any surface that comes into contact with food
- C. Ceilings
12. Good personal hygiene practices include all of the following EXCEPT A.  
Proper hand washing.
- B. Daily bathing.
- C. Getting regular dental check-ups.
13. When washing your hands, you should rub your hands together with soap for at least A. 20 seconds.
- B. 5 seconds.
- C. 10 seconds.
14. When washing dishes, how should they be dried?
- A. With a reusable cloth towel
- B. Air-dried
- C. With your apron
15. In the refrigerator, cooked foods should be stored where?
- A. Above raw foods
- B. Below raw foods
- C. It does not matter
16. What is a commonly heard statement about food safety?

- A. "Use it or lose it!"
- B. "Make it or break it!"
- C. "When in doubt, throw it out!"

17. The best way to clean your hands before preparing food is to:

- a) Wipe them with a wet dishcloth or towel.
- b) Wipe them on your clothes.
- c) Rinse them under running water.
- d) Wash them with soap and warm running water.
- e) Not sure

18. If you have diarrhea, it's okay to prepare food for others if you wash your hands first.

- a) Agree
- b) Disagree
- c) Not sure

19. Cooking eggs until both the yolk and white are firm will kill harmful germs. a) Agree

- b) Disagree
- c) Not sure

20. Using the same cutting board to cut up raw meat and then cut raw vegetables is safe as long as you wipe the board off with a clean cloth between the different foods. a) Agree

- b) Disagree
- c) Not sure

21. After you have mixed any food components with your hands, which of the following best describes what you should do next before continuing to cook? a) Wipe your hands on a towel or cloth.

- b) Rinse your hands under warm running water.
- c) Wash your hands with soap and warm running water.
- d) Continue to cook without washing hands.
- e) Not sure

22. If you use a dishcloth to wipe up liquid from meat, oil or soup, you can safely continue to use the cloth for washing dishes if you rinse the dishcloth in hot water. a)

Agree

b) Disagree

c) Not sure

23. Pasteurization of milk and fruit juice helps prevent foodborne illness. a)

Agree

b) Disagree

c) Not sure

24. It is safe to use raw eggs in recipes that will not be cooked.

a) Agree

b) Disagree

c) Not sure

*For questions 25-30, indicate whether the following foods are safe to eat or should be thrown away if left out at room temperature for more than 4 hours.*

25. Cooked rice at room temperature for more than 4 hours

a) Throw away

b) Safe to eat

c) Not sure

26. Cooked meat at room temperature for more than 4 hours

a) Throw away

b) Safe to eat

c) Not sure

27. A whole apple at room temperature for more than 4 hours

a) Throw away

b) Safe to eat

c) Not sure

28. A baked bread at room temperature for more than 4 hours

a) Throw away

b) Safe to eat

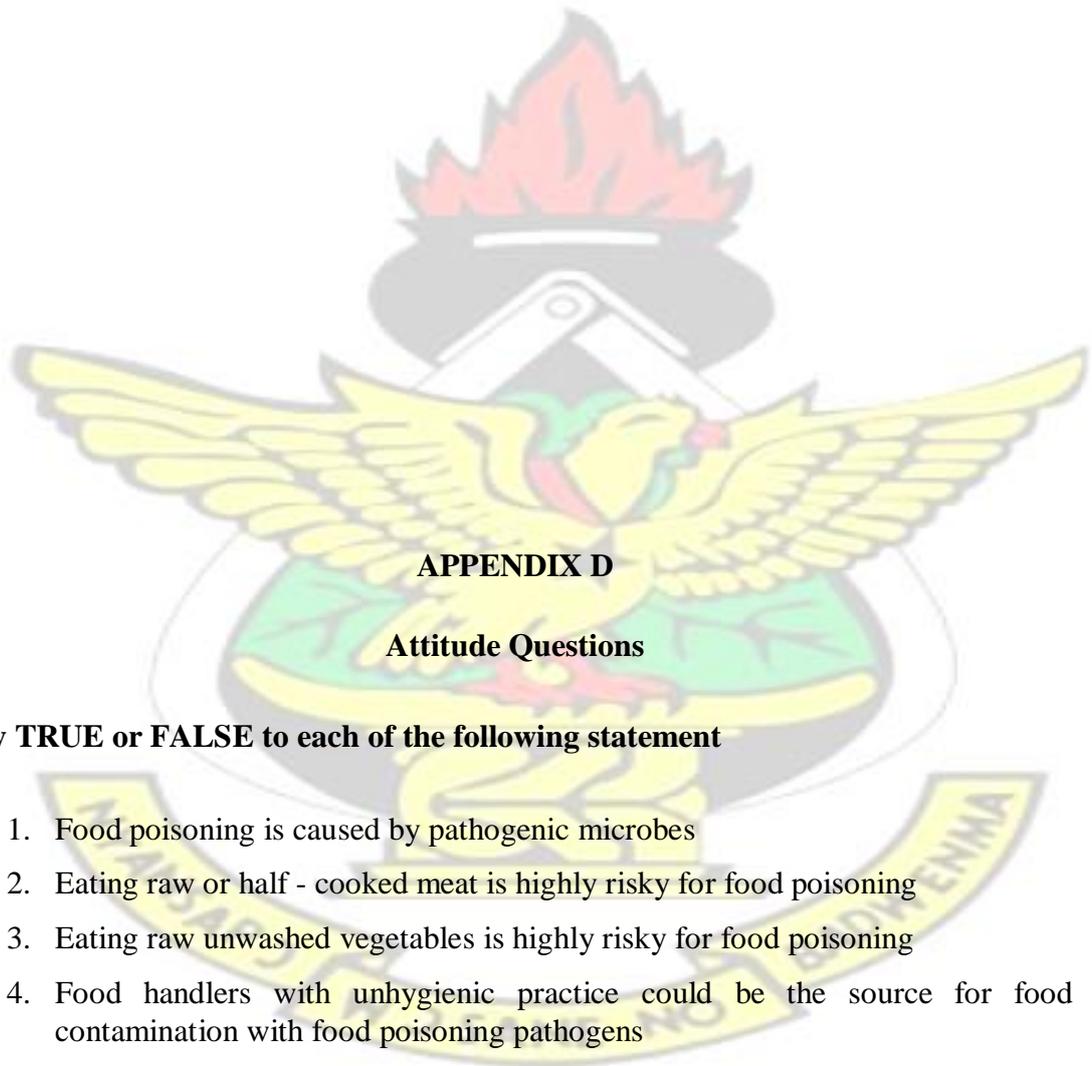
c) Not sure

29. Which of the following powers does FDA Officers NOT have? A.

Authority to close down premises.

- B. The power of arrest.
- C. Authority to enter premises without appointment.
- D. The power to seize foods.

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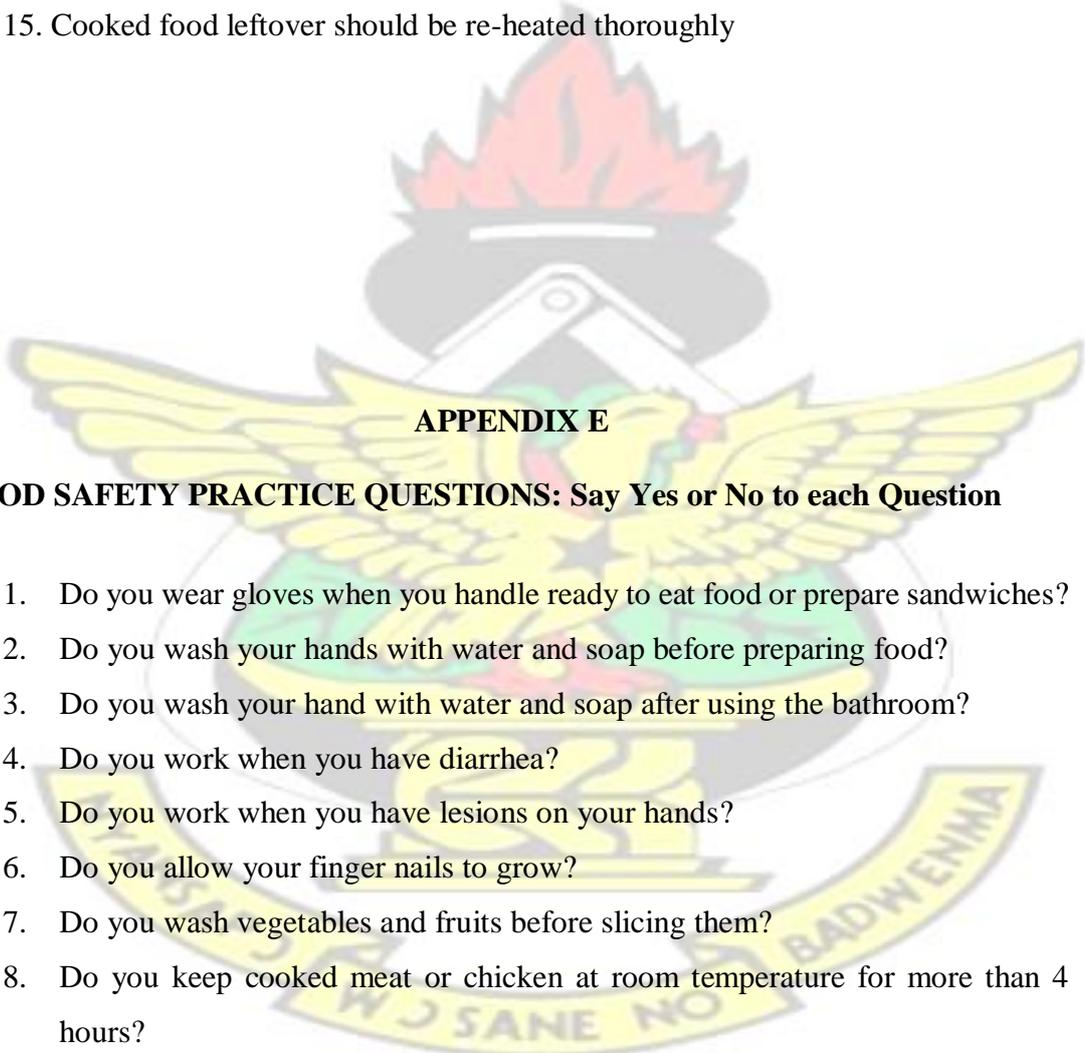
## APPENDIX D

### Attitude Questions

**Say TRUE or FALSE to each of the following statement**

1. Food poisoning is caused by pathogenic microbes
2. Eating raw or half - cooked meat is highly risky for food poisoning
3. Eating raw unwashed vegetables is highly risky for food poisoning
4. Food handlers with unhygienic practice could be the source for food contamination with food poisoning pathogens
5. Eating covered leftover cooked food, kept at room temperature for more than 6 hours, is at high risk to cause food poisoning
6. Keeping food at refrigerator temperature helps to prevent food poisoning
7. Contacting ready to eat food with bare hands cause food contamination with food poisoning pathogens

8. The correct method for thawing frozen meat or broiler is to keep them overnight at room temperature
9. Food poisoning could cause severe diseases that end in hospitalization and sometimes death
10. Apparently healthy food handlers might carry food-borne pathogens
11. Insects such as cockroaches and flies might transmit food-borne pathogens
12. Harmful bacteria multiply quickly at room temperature
13. Foodborne pathogens can be seen by the eye
14. Vegetables should be placed on higher shelf in refrigerator than meat and poultry
15. Cooked food leftover should be re-heated thoroughly



## APPENDIX E

### FOOD SAFETY PRACTICE QUESTIONS: Say Yes or No to each Question

1. Do you wear gloves when you handle ready to eat food or prepare sandwiches?
2. Do you wash your hands with water and soap before preparing food?
3. Do you wash your hand with water and soap after using the bathroom?
4. Do you work when you have diarrhea?
5. Do you work when you have lesions on your hands?
6. Do you allow your finger nails to grow?
7. Do you wash vegetables and fruits before slicing them?
8. Do you keep cooked meat or chicken at room temperature for more than 4 hours?
9. Do you clean food contact surfaces before and after preparing food?
10. Do you work when you have cold?
11. Do you wash fresh vegetables and fruits in tap water before eating?
12. Do you wash your hands with water and soap before eating your meal?
13. Do you wash your hands with water and soap after handling raw meat?

14. Do you wash your hands with water and soup before serving meals?

*This is the end of the questionnaire.*

*THANK YOU for your participation in this study!!!*

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