

**UNIVERSITY OF EDUCATION, WINNEBA
COLLEGE OF TECHNOLOGY EDUCATION, KUMASI**

**INVESTIGATING THE HYGIENIC CONDITION OF NAPKINS USED BY
CONSUMERS IN SOME SELECTED FOOD JOINTS IN ABIREM AND AFOSU
IN THE BIRIM NORTH DISTRICT OF THE EASTERN REGION OF GHANA**

CYNTHIA THOMPSON NAA-ODEY

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**A Dissertation in the Department of Catering and Hospitality Education, Faculty of
Vocational Education, submitted to the School of Graduate Studies, University of
Education, Winneba, and in partial fulfilment of requirement for the award of the
Master of Technology (Catering and Hospitality Management) degree**

APRIL 2021

DECLARATION

STUDENT'S DECLARATION

I, CYNTHIA THOMPSON NAA-ODEY, declare that this dissertation, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and that it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE:

DATE:

SUPERVISOR'S DECLARATION

I, DR. ELLEN OLU, hereby declare that the preparation and presentation of this work were supervised in accordance with the guidelines on supervision of dissertation as laid down by the University of Education, Winneba.

SIGNATURE:

DATE:

DEDICATIONS

This thesis would not have been possible without the support of god and many people.

I would therefore like to extend my heartfelt appreciations and dedication to:

Dr. Ellen Olu, my supervisor, for her professional expertise, accessibility, support and constructive critique on the various chapters of this work.

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ABSTRACT

Napkins used by consumers in some selected food joints in New Abirem and Afosu townships in the Birim North District of the Eastern Region were examined to determine the hygienic conditions of such napkins made available by food vendors at the various food joints and the extent to which consumers may be exposed to micro-organisms and dirt after using these napkins to wipe their hands and lips. Microbial contents of napkins from 5 sampled food joints were analysed for *Faecal coliforms*, *Escherichia coli*, *Salmonella* spp, and *Clostridium* spp. *E. coli* was found higher in all the napkins sampled from each of the food joints with a mean ranging from 1.76 to 3.36. *Salmonella* spp. with mean value ranging from 0 to 0.57 was identified to be present in napkins from three food joints. However, *Clostridium* spp. and Faecal coliforms were completely absent in all napkins from all food joints. Sources of contamination have been found to range from the individuals (consumers and vendors) who used these napkins, how napkins were stored prior to and after use by consumers, ineffectiveness of the washing and drying methods of napkins, prolonged use of a single napkin by several consumers before it is either changed or washed, a very wide napkin to consumers ratio, fewer number of napkins available on daily basis for use by consumers, to the environment in which these napkins were kept. This study has shown the need for good hygienic practices by the operators of these food joints due to the multi-user -nature of their facilities, by making sure napkins made available for use by their prospective consumers are hygienic, free from pathogens, and do not serve as a media for inoculation of innocent consumers and their respective dependants. This study therefore, proposes the need for national discourse, in terms of awareness creation among consumers and the general public on the dangers of napkins use at food joints in the study area and Ghana at large.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Street vended foods are not only appreciated for their unique flavours, convenience and the role which they play in the cultural and social heritage of societies, they have also become important and essential for maintaining the nutritional status of the populations (Boateng-Acheampong, 2014). Besides offering business opportunities for developing entrepreneurs, the sale of street foods can make a sizeable contribution to the economies of developing countries. In India, the National Policy for Urban Street Vendors/Hawkers stated that street vendors constituted approximately 2% of the population (Indian Street Food Policy, 2004).

Dr. Paa-Nii Johnson, Head of Processing and Engineering Unit of the Food Research Institute, told the Ghana News Agency that the socio- economic survey of 334 vendors and a mini census indicated that street-vended foods made an important contribution to the economy of Accra (Agyei-Takyi, 2012). The street foods sector employs more than 60,000 people with an estimated annual turnover of about 100 million dollars and a profit of 24 million dollars (Agyei-Takyi, 2012). Street foods are perceived to be a major public health risk due to lack of basic infrastructure and services, and difficulty in controlling the large numbers of street food vending operations because of their diversity, mobility and temporary nature (Boateng-Acheampong, 2014 & Rane, 2011). A general lack of factual knowledge about the epidemiological significance of many street vended foods, poor knowledge of food joints operators in basic food safety measures and inadequate public awareness of hazards posed by certain foods has severely hampered the deployment of a precise scientific approach to this very serious issue of public health

and safety (Boateng-Acheampong, 2014 & Rane, 2011).

Food joints are ready-to-eat foods and beverages prepared and sold by vendors or hawkers in streets and other public places (FAO, 2013). Food joints contribute significantly to the diet of many people in the developing world (FAO 2010; Sunitha, Manjula, & Depur, 2011). Food joints are public health concern, since hygiene of napkins can be difficult to practice at street level in settings where resources are scarce and surroundings are of low environmental and sanitary standards (Mensah, Armar-Klemesu, Hammond & Nyarko, 2011). Diarrheal diseases due to contaminated and unhygienic condition of napkins are among the causes of illnesses in most communities and are linked to street foods such as fast foods (World Health Organization, 2009). According to the study by Waters (2019) consumers rarely get napkins at fast food places. It is indicative of how cheap and uncaring of cleanliness these fast food places are. They hide the napkins behind the counter. A napkin is a rectangle of cloth used at the table for wiping the mouth and fingers while eating. It is usually small and folded sometimes in intricate designs and shapes (Waters, 2019).

According to Amoah, Adonu & Paintsil (2018), increasing attention has therefore been given to the issue of hygiene in the food joints. As a result, most food joint operators are challenged with the need to prepare and serve food under clean and hygienic conditions and with standardized procedures. Fast food service is a form of generating income for individuals and provides enormous benefit to the society at large. Fast food is delicious, inexpensive and convenient but also presents new public health challenge to consumers (Ridgewell, 2016). The hygienic aspects specified in the code of hygienic practices for food joint establishments are a major concern for food control officers. Most food joint operators are not knowledgeable when it comes to hygienic practices and what it entails.

They mostly rely on their inadequate and sometimes wrong experience and practices in their operations, which the result is illnesses. Personal hygienic practices such as the proper washing of the hands with germicidal soap under running water according to Peach and Thompson (2017) as well as keeping the finger nails short and clean, covering food when cooking, serving food at the correct temperature and providing correct and clean napkins when serving food are some of the key ways of maintaining safe food at the street level.

Bienstock & DeMoranville (2003) evaluated food safety and sanitation procedures in relation to customer perceptions of service quality. According to their study, 88% of consumers associate clean napkins with better food service. Threemitaya (2003) found, in Thailand, that consumers consider hygiene and cleanliness of fast food joints when dining out. Zeithaml et al. (1990) and Aksoydan (2007) suggested that food service establishments that failed to meet the standards of food hygiene and delivery of clean aprons, bar towels, table cloths, and napkins expected by customers would be assessed as having poor or low-quality service. Pettijohn (2017) found quality, cleanliness of table cloth, and napkins, and value to be the most important attributes customers consider in selecting fast-food restaurants. The cleanliness of the napkins was also found to be an important criterion when a customer evaluates the overall quality of a food service establishment (Klara, 2004; Barber & Scarcelli, 2009).

Food joint operators in Ghana are mostly not educated when it comes to catering (Quarmine, 2011). Most people enter this trade because there are no rules that say that an individual without any catering educational background cannot become a food joint operator. Most food joints failed to get fresh, clean, fancy napkins to promote a formal esthetic. This method is environmentally not ideal, and usually failed to promote a very

nice atmosphere. However, uncontrolled fast food joints could result in serious environmental hygiene problems and possible deterioration in law and order in the event of unscrupulous practices by the operators. This research work focuses on the hygienic condition of napkins used by consumers in some selected food joints in New Abirem and Afosu townships located in the Birim North District of the Eastern Region of Ghana.

1.2. Statement of Problem

Even though the food chain industry is considered an important part of the economies of many developing countries by providing employment and readily accessible cooked meal at relatively cheaper prices (Wuliyeng, 2013), there have been major concerns over the quality services provided in terms of food and environmental quality with little to no attention given to the conditions of napkins made available to be used by consumers. Most fast food joints provide unhygienic napkins to consumers either deliberately or not since much attention has not been drawn to it, most operators of food joints in Ghana and in Africa at large, to a greater extent, are lacking in knowledge, education or training on basic hygienic practices to ensure cleanliness of their napkins. As a result, street foods joints may serve as places for transmission of micro-organisms and other illnesses among consumers through the use of unhygienic napkins. The Abirem and Afosu townships saw an influx of people from 2010, when the construction stage of the mine had just started. As such, most of the influx was predominantly mine workers and the rest were people who had settled in the twin-communities with the hope of securing employment with Newmont Akyem Mine. This development however, brought lots of pressure on the local resources and the few food joints that were available at the time since almost every worker had to buy food before reporting to work and after close of work. As a result, the two communities has since 2010, seen a number of food joints and

vendors sprouting out with little to no discussions on the environment they are operating in and also the hygienic nature and conditions of the napkins provided for use by consumers. These raise concerns on the hygienic practices of publicly sold food by food joint operators to ensure that napkins presented to consumers are of good condition. It is based on this background that this study delves into the hygienic condition of napkins used by consumers of some selected food joints in Abirem and Afosu communities in the Birim North District of the Eastern Region of Ghana.

1.3. Main Objective of the Study

The general objective of the study is to investigate the hygienic condition of napkins used by consumers of some selected food joints in Abirem and Afosu in the Birim North District of the Eastern Region of Ghana.

1.4. Specific Objectives of the Study

The specific objectives were to:

1. To investigate the types of contaminating microorganisms in the napkins used by consumers from the selected food joints.
2. To determine whether or not the same napkins are being used by consumers that visits the various food joints (consumer napkins ratio).

1.5. Research Questions

Based on these objectives, this study addresses the following research questions:

1. What micro-organisms do these napkins used by consumers at the various food joints contaminated with?
2. How often are these napkins made available at the various food joints being washed and ironed?

1.6. Significance of Study

The findings from this research work is of great importance to operators of food joints in Abirem - Afosu township and most importantly, the respective customers of such food joints to make an informed decision in relation to operational and behavioural changes where possible, to ensure their own safety. Additionally, it will help the Birim North District Assembly (BNDA) to identify the right sets of regulations and exercises that should be formulated and put in place (implemented) to ensure good hygienic practices by food vendors and also provide evidence-based information that will inform policy directions including monitoring of the activities of these food joints operations in the District. Moreover, this research work will serve as a source of references for future studies on any possible topic related to the hygienic condition of napkins.

1.7. Scope of the study

The research work was geographically, limited to New Abirem and Afosu in the Birim North District of the Eastern Region of Ghana. As a result, the study will identify and study in hygienic terms, the food joints available in these two communities that allow consumers to sit and eat where there is the possibility for napkins to be provided to consumers. Food joints that provided take-away services to consumers were not included in the study. Again, food joints vendors that were not willing to cooperate with the researcher were also not included in the study. In context, the research work considers the safety of consumers of the various food joints, with concentration on the hygienic conditions of the napkins provided for use by the service providers.

1.8. Organisation of study

This research work is divided into five chapters. Chapter One provides a general

introduction and set the basis for the study. Chapter Two discusses relevant literature and empirical evidence related to food vending practices. Chapter Three describes the methodology used in gathering data for the research. The study population, the sample and sampling procedure, research instruments, data collection procedure and data analysis procedure are described in this chapter. Chapter four presents and discusses the findings of the research work. The final chapter summarises the findings, draws conclusions, and makes recommendations for persons who depends on food joints (consumers) and the general public, food joints operators, policy makers and the BNDA. It also suggests areas for further works.

1.9 Definition of Terms

For the purpose of this study;

Napkin: refers to a small piece of a paper or cloth material made available at the various food joints by the vendors to be used by consumers in wiping their hands or lips after eating.

Food joints: Traditional catering establishments which exist in both rural and urban areas in or near markets, transport terminals, and roadsides which offers seat and eat services. These exclude all catering establishments that offer take-away-services.

Food safety: The assurance that food will not cause harm to the consumer when it is prepared and or eaten according to its intended use.

Food hygiene: All conditions and measures to ensure the safety and suitability of food at all stages of the food chain

Micro-organisms: these are disease causing organisms which when present on a napkin, cannot be seen by both the vendor and the consumer.

Foodborne illness: sickness caused by indigestion of food containing toxic substances produced by micro-organisms.

CHAPTER TWO

LITERATURE REVIEW

2.0. Introduction

This chapter reviews literatures related to the study so as to establish what is known both theoretically and empirically and the knowledge gap that needs to be filled and thus has warranted the study.

2.1. Microorganisms

Microbes fall into two main categories, prokaryote and the eukaryotes depending upon whether they have a cell nucleus, example, *bacteria*, *fungi*, *algae*, *virus*, *protozoans* and similar *archaea* bacteria. In some instances, infections by *bacteria*, *fungi* or *virus* can cause disease (Christian, 2013).

Contamination by these organisms also can make food unsafe to eat, example, *E. coli* are commonly found in the large intestines of unhealthy individuals and animals. Most strains are harmless, but a few kinds can cause disease. Some *E. coli* can cause "travelers' diarrhea" and intestinal infections. Harmful strains are spread by food or water contaminated with animal or human waste, poor hygiene, especially when one does not wash the hand properly (Nancy *et al.*, 2008). Common microbes that are found on contaminated surfaces are *coliforms* such as *Escherichia coli*, *Clostridium* spp. *Salmonella* spp. and *Enterococcus* (Christian, 2013). The capacities of these bacteria to survive for several hours further increase their chances of contamination in other places. Transfer of microorganisms by personnel particularly from hands, is of vital importance. During handling and preparation of food, bacteria are transferred from contaminated hands of food workers to food and subsequently to other surfaces (Samakupa, 2003). Low infectious organisms such as *Shigella* and pathogenic *Escherichia coli* have been linked to hands as a source of contamination (Snyder, 1998). Poor hygiene, particularly

deficient or absence of hand washing has been identified as the causative mode of transmission. Many *nosocomial* pathogens can also survive on dry inanimate surfaces for months (Kramer, 2006). Research have shown that *Escherichia coli* is the most widely adopted indicator of faecal pollution and they can also be isolated and identified simply with their numbers and they are usually given in the form of faecal *coliform*/100 ml of waste water (De Boer *et al.*, 2008). *Coliforms* such as *E. coli* can also cause urinary tract infection and diarrhoea (Fine *et al.*, 1996).

2.1.1 Niches of microorganisms

Microbes grow and reproduce in habitats where no other organisms can survive. They can be found in hot springs and deep underground vein of water, in volcanic rock beneath the ocean floor, in extremely salty water in the Great Salt Lake and dead sea, and below the ice of Antarctica, not even radiation or high levels of deadly chemicals such as, lead or sulphur, can kill the hardiest of microbes, referred to by scientists as “*extremophiles*”. Microbes are also found in more unexpected places such our hands and other parts of the human body and the immediate environment. Microorganisms are known to spread via air, water, food, etc. an important mechanism of the spread of pathogens by fomites (Barolia *et al.*, 2012). Food, water and soil borne infection are estimated to be affecting almost half of the world population (Barolia *et al.*, 2012). Microbes found in air altitude of 500 feet in clear weather include spores of *Bacillus* and *clostridium*, *ascospores* of yeasts, *fragment* of *mycelium* and *spores* of *moulds* and *streptomycetaceae*, *pollen*, *protozoa cysts*, *algar*, *micrococcus* and etc. In the dust and air of schools and hospital wards or rooms of persons suffering from infectious diseases microbes such as *Tubercercles bacilli*, *Streptococci*, *pneumococci* and *staphylococci* have been found to exist (Tagoe *et al.*, 2011). Materials such as napkins or cloths are also

more likely to be contaminated by *coliform* bacteria's due to frequent touch of the material, these respiratory bacteria called microbes are dispersed in air droplets of saliva and mucus produced by coughing, sneezing, talking, handling and laughing, all of these microbes from air and around the environment are possibly found on catering service napkins in different locations. Microbes that appear on canteen napkins are as a result of human unhygienic conditions associated with it. The ecological niche for *S. aureus* in humans is in the *anterior nares* (Miller *et al.*, 2008). In practice almost, every microbe can appear on used napkins but survival depends on the environmental conditions of where the napkins are found and the possible nutrients available. Spills and substances contamination further enhance survivability and presence of microbes.

2.1.2 Common microbes found on used napkins

Bacteria that are often found on used napkin or cloth which are often transfer from one person to another are *coliform* bacteria organisms such as *Total coliforms*, *Faecal coliforms* and *Escherichia coli* and others like *Clostridium* spp. *Enterococcus* species, *Streptococcus* and *Salmonella* spp. (Christian, 2013). The ability of these bacteria to survive for several hours further increases their chances of contamination in places. Studies have shown that the presence of touching materials with improper washing of the hand and low temperature with high humidity results in long life time of bacteria on the contaminated surface (Kramer, 2006).

2.1.3 Coliform bacteria

They are commonly used bacterial indicator of sanitary quality of foods and water. They are defined as rod shaped Gram-negative non-spore forming bacteria. *Coliforms* can be found in the aquatic environment, in soil and on vegetation; they are universally present

in large numbers in the faeces of warm-blooded animals (Christian, 2013). While *coliforms* are themselves not normally causes of serious illness, they are easy to culture and their presence is used to indicate that other pathogenic organisms of faecal origin may be present. Faecal pathogens include bacteria, viruses, or protozoa and many *multicellular* parasites, which can ferment lactose with the production of acid and gas when incubated at 35-37°C.

2.1.4 Total coliforms

Total coliforms include organisms that can survive and grow in water, hence, they are not useful an index of faecal pathogens but they can be used as an indicator of treatment effectiveness and to assess the cleanliness and integrity of distribution systems. *Total coliforms* should be absent immediately after disinfection and the presence of these organisms indicate inadequate treatment (WHO, 2008).

2.1.5 Faecal coliforms and Escherichia coli

Faecal coliform bacteria are part of the *Enterobacteriaceae*. *Citrobacter*, *Enterobacter*, *Escherichia coli*, and *Klebsiella* also belong to this family. *Faecal coliform* bacteria originate in worm-blooded animals digestive tracts. They are usually linked with *Vibrio cholera*, which is a type of Hepatitis virus and also comes from digestive tracts (Chia-Wei *et al.*, 2010).

E. coli is most widely adopted indicator of faecal pollution and they can also be isolated simply with their numbers and is usually given in the form of faecal *coliforms*/100 ml of waste water (De Boer *et al.*, 2008). *E. coli* causes urinary tract infection and diarrhoea (Fine *et al.*, 1996). Isolation of the bacteria from a contaminated surface is a clear indication aseptic procedure by users if all is not effective in significantly reducing the

level of the organism on the material to an acceptable level (Kumer *et al.*, 2010).

2.1.6 Clostridium and Enterococcus spp.

Usually found in human gastrointestinal tracts and environments such as sewage and soil. It does not survive on materials as its primary target is living tissues. Individual affected with *Clostridium perfringens* usually develop diarrhoea and severe abdominal pain (Rusin *et al.*, 2002).

Enterococcus have been found to survive in dry conditions and on various fabrics utilized in health care environment. Infectious pathogens may be transferred to the mouth after handling an everyday contaminated household object (Rusin *et al.*, 2002).

Enterococcus bacteria are usually found in the bowel and are known to be able to survive adverse conditions that other bacterial usually will not grow in. They are known to survive at temperatures of 60 degrees Celsius and anaerobic conditions with varying degrees of acidity.

2.1.7 Streptococcus and Salmonella spp.

They are mostly anaerobic, while some are facultative anaerobes. They do not carry out oxidative phosphorylation and can survive in more acidic environments which might be present on contaminated napkins. Medically significant Streptococcus requires lots of amino acids, vitamins and nutrients thus are not usually isolated in an environment. (“<http://nizetlab.ucsd.edu/streptococci/>”).

Salmonella spp. belongs to the family *Enterobacteriaceae*. They are motile: Gram-negative *Bacilli* that do not ferment lactose but most produce hydrogen sulfide or gas from carbohydrate fermentation. Originally, they were grouped into more than 2000 species (*serotypes*) according to their somatic (o) and flagella (H) antigens (Kauffmann-

White classification). It is now considered that this classification is below species level and that there actually not more than 2-3 species (*Salmonella enteric* or *Salmonella choleraesuis*, *Salmonella bongori* and *Salmonella typhi*), with the *serovars* being subspecies. All of the *enteric* pathogens except *S. Enteric*, *Salmonella* infections typically cause four clinical manifestation; gastroenteritis (ranging from mild to fulminate diarrhoea, nausea and vomiting), *bacteraemia* or *septicaemia* (high spiking fever with diarrhoea) and a carrier state in persons with previous infections. Although typhoid is uncommon in area with good sanitary systems, it is still prevalent elsewhere and there are many millions cases each year (Angulo *et al.*, 1997). Heterotrophic microorganisms include both members of the natural (typically non hazardous) microbial *flora* of water environments and organisms present in a range of pollution sources. They occur in large numbers in raw water sources. The principal determinants of growth or 'regrowth' are temperature, availability of nutrients, *assimilable* organic carbon, lack of disinfectant residual and stagnation (WHO, 2008).

2.1.8 Other microbes

Aerobic Gram-positive *bacilli* are frequently isolated from a wide variety of environmental sources and are usually not of medical importance. *Micrococci* are also found in the environment and are members of the normal *flora* in humans. *Micrococcus luteus*, however, can cause *endropneumonia* in immune compromised patients (Mims *et al.*, 2004; Strohl *et al.*, 2001). *Fungi* are very common and widely distributed environmental organisms. It should be noted, however, that even non-pathogenic *fungi* can cause serious morbidity and mortality in immune compromised persons such as HIV/AIDS patients undergoing treatment for various malignancies, and those suffering from diabetes mellitus (Hartmann *et al.*, 2004; Elliot *et al.*, 2001).

2.1.9 Factors influencing microbial growth on contaminated napkins

Microbial growth in general is affected by a lot of factors. These factors go a long way to determine the type and the number of a particular environment. Below are some important factors that affect the survival and growth of microbes on contaminated napkins. The temperature of an idle napkin is dependent on the temperature of the environment. The temperature increases slightly with use since heat is produced from the hands. Kaiser (2006) stated that, bacteria have a minimum, optimum and maximum temperature for growth and can be divided into three (3) groups based on their optimum growth temperature. The pH of napkins are affected by other external factors such as wet or dry hands that it comes into contact with, generally, the pH is mostly affected by the sweat or wet from the fingers or the hands. The pH of sweat could range from acidity 5.0 to a slightly alkaline 7.2 depending on the rate of sweat of the individual, with a lower of sweating equating to a lower pH, since it has also been observed by the creation of an acidic sweat by the computer keyboard due to its less stress activity by users (Chia-Wei *et al.*, 2010). The moisture of a contaminated napkin niche will vary depending on the environment in which it is situated and the way it has being put into used. Often times, it will seem dry. However, practices like cleaning or wiping with wet hands or fingers provide a little bit of moisture, at times it even get soak with enough water which make it even more wetter than ever. Spills from food found on the napkins after wiping contribute to microbial growth as they provide a medium for growth and survival of these microbes responsible for the contamination from spills are bacteria, moulds and *yeast* from the air or left over from the hands. Some bacteria such as *lactococci* and *lactobacilli* will convert lactose to glucose and galactose, then into lactic acid. Some bacteria will attack the protein and decompose some protein and fat. Bacteria need lots of water to grow well, the wet environment of the contaminated napkins after wiping will

further encourage their growth, when the residue is completely dried and the carbohydrate and the proteins are used up, bacteria growth and multiplication reduce until the spot gets wet again with spills or wet environment as it was also observed in public cafes on keyboards could also be a potential factor to this study (Chia-wei *et al.*, 2010)

2.2. State of Napkins Used by Consumers

Food joints, just like microbes are almost everywhere today and they continue to have an increased in presence in almost every aspect of our daily lives since man cannot live without food (Christian, 2013). Foods served at these joints are usually eaten with the bare hands with napkins being used to wipe the hands and the lips after washing. Most of these napkins are either torn, dirty, or better still could not be described as a piece of cloth or a shirt of a family member. There is the tendency of these napkins to act as a reservoir for microbes (Christian, 2013). The unhygienic use of materials especially for food services has been documented to be responsible for the spread of diseases such as intestinal tract infections (Nancy *et al.*, 2008). Napkins are usually made of cloth, with a very smooth texture which provides comfort for wiping surfaces such as the hands or the lips. The texture or the quality of the material from which napkins are made from are able to hold certain amount of water or moisture, for which the constant use of these materials for longer period provides the required food source for microbes to live on the moist surfaces of the napkins. Dead skin cells are constantly being sloughed off, so a good amount falls into the napkins. The napkins which may be folded after use and passed on to another customer can be a potential source of bacteria leading to the promotion of the growth and reproduction of microbes since microbes are said to be spread by many fomites (Barolia *et al.*, 2012). According to Scott *et al.*, (2008), where

contaminated surfaces come into even relatively brief contact with fingers or an inanimate surface, a significant number of organisms can be transferred. Primary food production should not be carried out in areas where the presence of potentially harmful substances would lead to unacceptable levels of such substances in food (Boateng-Acheampong, 2014). Potential sources of contamination from the environment should also be considered by food vendors to safe food production. Dangerous microorganisms are widely found in soil, water, animal and people and these microorganisms are carried on hands, napkins, and utensils, cutting boards and the slightest contact of these microorganisms to food can cause food borne diseases (WHO, 2012).

A study was carried out by (Christian, 2013) to investigate the type of microorganisms and the health hazards associated with customer cloth napkins in canteens within the UDS, Nyankpala campus. Microorganisms identified were *E. coli* and *Salmonella* spp. where *Clostridium* spp. and *Faecal coliforms* were completely absent. *E. coli* was found to be higher in almost all the canteens with a mean value ranging from 1.76 to 3.36 followed by *Salmonella* spp., also with mean value ranging from 0 to 0.57. These bacteria identified had pathogenic potentials and hence their presence in contaminated cloth napkins was a cause for concern since *gastroenteritis* and urinary tract infections and other diseases were related to personal contact with these bacteria. The study revealed that microbial contamination of napkins was common and the sources of contamination were found to range from the air, the temperature, individuals who used the napkins, to the environment they were kept. Because napkins are usually transferred from one consumer to another for more than eight hours in a day before they are washed and dried, these napkins are susceptible to bacterial contamination during handing from one person to another. As a result of this practice, the napkins are subjected to many infectious diseases and have the potential spreading diseases since it could act as a hive

for microorganisms. As such, no matter how much you wash your hands after eating, one can still be moving around with pathogens-inoculated-hands having wiped your hands using contaminated napkins unknowingly.

Scientific information about the occurrence of microorganisms on the surfaces of napkins and the hygienic condition of napkins at food joints generally is very little and needs to be enriched in order to educate people on the need for proper washing or regular changing of contaminated napkins. Many people believe that microbes are only present in research laboratories, hospitals and clinics and thus they have misleading feelings of securing themselves when at food joints.

There is evidence in the Environmental Health Departments of the various District Assemblies regarding monitoring of the various food joints for potentially unsafe equipment, unsanitary conditions and improper food preparation or storage on a regular basis as well as health screening of food vendors, but there is no documentary evidence on what is being done to ensure the napkins that you wipe your hands and faces on or even often eat off are cleaned properly. Lack of knowledge about where germs can prowl can result in health problems and the spread of diseases such as intestinal tract infections as a result of the unhygienic use of materials (Nancy *et al.*, 2008). The frequent touching of the contaminated surfaces by the food vendors including digging their nose with the hand and also coughing into their hands and subsequent serving of customers without regular washing of hands could result in self-inoculation of the napkins before making them available to customers.

2.3 Cleaning of Napkins used by consumers

This refers to how often napkins are washed and changed after used by consumers

Most food vendors wash and change napkins after each use by consumers. Some could

use the same napkins to serve several customers without washing it.

2.4. Storage and Handling of Napkins by Food Vendors

Chukuezi (2010), conducted a study on food safety and hygienic practices on street food vendors in Owerri, Ngira. Results show that 61-90% handled money with same hand while serving. These findings are similar to a study by Boateng (2014), which observed that a total of 355 (84.0%) of food vendors were observed to be using the same hands to serve and collect money. In most cases in Ghana, food vendors operate individually. Typically, a food vendor will be seen as dishing out food to customers and using that same hand collecting and giving change (Boateng, 2014). On the other hand, some sole proprietors would want to receive the money in order to monitor the progress of daily sales while they dish out food. After serving and collecting money, they will rather prefer claning their hands with the only available napkins meant for use by consumers. Meanwhile, certain chemicals are used in minting money and these chemicals we are told can be harmful to human health. The tendency to contaminate napkins as they use the same hand to dish out food and collect money is high. Secondly, the chemical components of money can also be harmful to the health of its patrons. Some food vendors may engage themselves in this practice because of convenience as it is easier when one hand dishes and collects the money than to dish food, collect money and wash hands before serving the next client. Certain security checks on the authenticity of currency used to buy food requires that the hand must be used to feel money before its genuines can be ascertained. The person handling money should not handle napkins without washing his/her hands because money is dirty and can contaminate safe napkins. Secondly, some vendors either hang their napkins on walls or dump them on the dining tables making napkins susceptible to contamination prior to use by consumers.

Pathogens can be passed mechanically by flies because *Salmonella typhimurium* and *shigella* can multiply in the gut of the housefly and can be excreted for weeks or longer. There is consequently a risk of contamination associated with the exposure of napkins to flies. Flies like habiting in gutters, places of convenience and dirty environments. As such, exposing napkins to these environments, creates congenial atmosphere for flies to exist and serve as carriers of these disease-causing microbes. FAO (2008) notes that foods should be prepared in a place set aside exclusively for that purpose, while the place of preparation should be kept clean at all times and should be far from any source of contamination (rubbish, waste water, dust and animals). Vending stalls should be designed and constructed so that they are easily cleaned and maintained.

2.5. Personal hygiene in food service business

As a consequence of humans also containing microorganisms naturally or from the surrounding environment, it is important for food joints operators to maintain an appropriate personal hygiene (Boateng-Acheampong, 2014). Hygiene can be defined as all the activities performed for the preservation of Health, and may include but not limited to personal hygiene, food hygiene, kitchen hygiene, toilet hygiene, production hall hygiene, medical facility hygiene (Opoku-Boateng, 2017). Irrespective of the category of hygiene, the purpose is to prevent illness. Whilst observing hygiene at home is very important to your health, practicing personal hygiene in the environment where there is mass production of food is even more important. In production halls and kitchens, personal hygiene, kitchen hygiene, fridge or cold store hygiene is imperative (Opoku - Boateng, 2017).

There are several factors that cause diseases, but the majority of diseases are caused by

pathogens. Pathogens related to food can be found in several places including raw materials, water used for cooking, the utensils and equipment used for cooking including knives, cutting boards and surfaces on which food items are placed. Other sources of contamination could be fridges and cold rooms (Opoku- Boateng, 2017). Basically, human intervention is needed to get all the items and places mentioned above in hygienic mode in order to prevent the spread of pathogens. This is where people involved in maintaining good hygiene in places of work such as food joints, restaurants and production halls must themselves be hygienic in order to avoid cross contamination. It is the goal of ensuring food safety that brings good personal hygiene into sharp focus. Poor personal hygiene can bring its wake; very serious contamination issues the result of which could be fatal or near fatal (Opoku-Boateng, 2017).

2.6. Foodborne Diseases

For decades and through various evolutions man has always made efforts to avoid diseases and find ways to cure existing ones in order to improve and prolong life. Various diseases have led to the loss of human life irrespective of age. Diseases especially those caused by our daily intakes and activities, such as food and hygiene, continue to be a threat to human health and life. It is obvious and globally acclaimed that unhygienic food and other forms of contamination of our daily consumables have led to the death of millions of people throughout the world, especially in Africa where lack of education, poverty, poor public health policies, lack of qualified personnel, poor financing of health system among other reasons have left Africa and for that matter Ghana at the mercy of every outbreak from unhygienic food (Ntiforo, 2001). There should therefore be a paradigm shift from looking for food diseases to cure, to what the diseases are and how they are caused. The World Health Organization estimated that in

developed countries, up to 30% of the populations suffer from foodborne diseases each year, whereas in developing countries up to 2 million deaths are estimated per year (Antle, 2000). Every day people all over the world get sick from the food they eat. There are several different types of contaminants that can cause foodborne illness. These contaminants include bacteria, viruses, parasites, and chemicals (WHO, 2002). Generally, contaminated food may look, smell and taste good even though it may be contaminated and could be capable of causing a foodborne illness (WHO, 2002). Foodborne illnesses may be classified as either food intoxication or food infection. Common symptoms in many foodborne illnesses are associated with the gastrointestinal tract and include nausea, vomiting, abdominal cramps and diarrhoea as common symptoms in many foodborne diseases (CDC, 2005). The most commonly recognized foodborne infections are campylobacter, salmonella and E. coli O157:H7 and by a group of viruses called calicivirus also known as the Norwalk and Norwalk-like viruses. The leading cause of foodborne illness is Norwalk-like viruses, far outpacing the rest at 23 million cases per year (CDS, 2005). This is far more common because it does not have to be associated with a particular food. The virus is transmitted from person-to-person through unhygienic practices and the contamination of food (CDS, 2005).

Campylobacter is the second most common bacteria to cause foodborne illnesses at 2.45 million cases of foodborne illness per year. This bacterium is associated exclusively with the cooking and handling of raw chicken. The third most frequent is salmonella at 1.4 million cases. Salmonella is commonly associated with chicken and eggs, but the bacteria can also be transmitted by activities such as playing with pet animals and not washing hands before eating. E. coli O157:H7 is the fourth most common bacteria to cause foodborne illness with just over 73,000 estimated cases annually. E. coli resides in

the digestive tracts of cattle and can contaminate beef during slaughtering. Undercooked ground beef or cross contamination are the most common causes (Angolo, 2011; Mead et al., 1999). In industrialized countries, temporary food handlers are an important source of foodborne disease. Ingestion of infected food can result in mild to severe illness, hospitalization or even death. Diseases with short incubation periods are more likely to be detected and attributed.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

Abirem-Afosu is a twin community in the Birim North District of the Eastern Region of Ghana. These two towns serve as the home of Newmont Akyem Project. Before the operations of Newmont Akyem, Mine, which has employed appreciable number of persons from these two communities and the District at large, farming was the leading and the major employer within the District. As a result of the impact of the mine and its related activities, many people in these communities have diversified from farming into several other businesses including food joints operations, supermarkets, Hotels and its allied services, and many more, making the towns very busy with lots of commercial activities. The towns house two famous Hotels in the region; namely Beige Village and Obaa's Golden Plaza Hotels. The twin town is the home of the only Ecobank branch in the Eastern region of Ghana, Barclays Bank, Consolidate Bank of Ghana and other several Rural Banks. New Abirem is the administrative town of the Birim North District and houses number of offices. The main water supply in these two towns is by Community Water Project which covers close to 85% of the entire population.

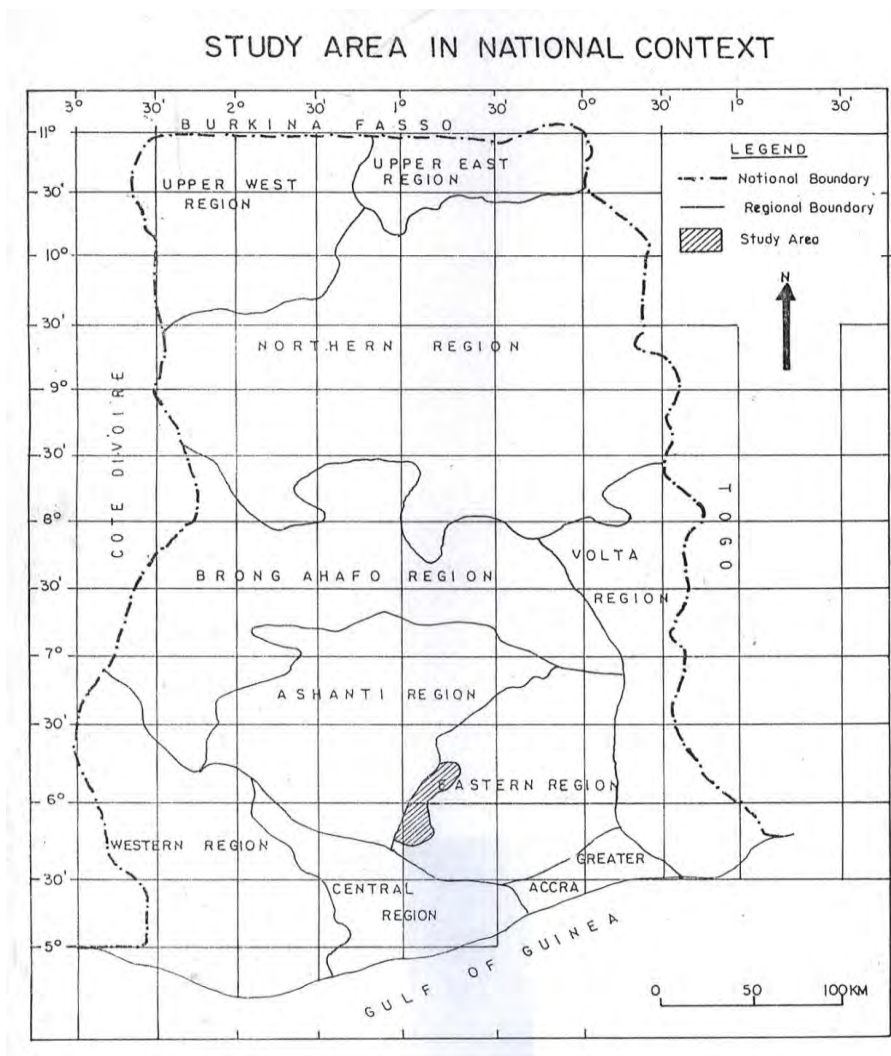


Figure 1- Birim North District in Regional and National Context.

The district covers an estimated total land area of 1,250 square kilometres. It covers about 6.47 per cent of the total land area of the Eastern Region.

3.1.2 Population Size and Distribution

New Abirem and Afosu in the Birim North District were the settings for this research with an estimated population of about 6,123 and 6165 respectively according to 2010 Population and Housing Census. This population however, was projected to be 7,142 and 7,191 respectively in 2018 (Birim North District Assembly, 2020). The women populations of the towns, which stood at 3,126 for New Abirem and 3,069 for Afosu

according to 2010 Population Census, are either involved in trading or palm oil production.

3.2. Research Study

The Research design adopted for the study is the descriptive survey research design. The research work also adopted qualitative and quantitative methods of data collection, analysis, and reporting. Research design denotes the structure and plan of the investigation used purposely for the attainment of the research objectives (Ophelia, 2017). The use of this method in this study helped in describing and exploring in as much as possible what occurred in the organization as a whole and also describing how employees (casual and permanent) with the work they did and the nature of employment contract. Babbie (2005) also believe that obtaining answers to a set of carefully designed and administered questions from a large group of people lies at the heart of a survey research.

3.3. Sample Size and Sampling Technique

The nature of the study gave room for purposive sampling to be adopted. Food joints that allowed consumers to sit and eat were sampled for the study out of those operating take-away services to consume Mensah et al. (2002), Again, simple random sampling was used in selecting the food joints and consumers to be worked on to avoid being biased and to give all the sampling units of interest, equal opportunities of being selected for the study. Moreover, stratified random sampling together with simple random samplings was used during data collection among consumers. The consumers were stratified into adults and children. Only adults were randomly selected for the data collection.

The total number of registered food vendors within the towns is about six hundred and seven (607). Out of this number, three hundred and forty-seven (347) were established in New Abirem and two hundred and sixty (260) were established in Afosu (BNDA, 2010). However, out of the 607 food joints, only 203 (33.4%) offer seat and eat services hence the focus of this study. According to the Environmental Officers from the District Assembly, screening exercises conducted for food vendors in 2019/2020 revealed that, 78 vendors out of the 347 registered vendors from New Abirem, and 76 out of the 260 registered vendors from Afosu were stopped from operating food joints and other food businesses for failing during the medical screening.

3.4 Instruments for Data Collection

Structured interview schedules were used to collect data from the food vendors. This was used because of the largely informal nature of food vending and the fact that usually informal operators have lower level of educational qualification. Thus, it can be assumed that most of the respondents may not be literate enough to respond to a questionnaire on their own without an interviewer to interpret in their local language. The interview schedules were structured into five sections based on the demographic characteristics of the respondents and the four specific objectives of the study the head of the Sanitation Unit of the municipal authority, the head of the Food and Drugs Board, the head of the Ghana Standards Board, and five sanitary inspectors. An observation checklist was designed and used extensively in examining the sanitary conditions of the food vending sites as well as food handling practices. Photographs were taken of these sites and practices to reinforce the data collected through the observations.

3.5 Distribution of Napkins

Due to the unwillingness of the owners and operators of food joints located in Abirem and Afosu to cooperate with the researcher to allow napkins from their facilities to be sampled for laboratory analysis for the fear of the researcher to tarnish the image of their businesses, only 5 out of the 203 food joints identified were sampled for microbial analysis. In all 15 new napkins were distributed across all the different food joints that were sampled for the study and it was given based on two weeks interval for three (3) consecutive times in six (6) weeks. A napkin was used to represent each food joint for a day at each period of sampling.

The collections of the samples were done on the same day of the distribution of new sets of napkins to the food joints to be used by consumers. The contaminated napkins were collected using protective gloves to avoid further contamination from the hand. The napkins were put into sterile polythene bags each and sealed. The polythene bags were labelled according to the selected food joints and transported on the same day of collection to the CSIR-Water Research Institute Tamale for microbial analysis.

3.6. Bacteria Analysis

Bacteria analysis of the contaminated napkins was determined immediately after the collection throughout the investigation period. Membrane filtration technique was used to determine *faecal coliforms*, *Escherichia coli* and the *Salmonella* spp. in accordance with APHA 9222D, 9260F and 9265B.

Stock solution of the various samples were prepared by transferring the contaminated napkins aseptically into sterile bowls containing sterile buffer peptone water with the aid of sterile forceps. The bowls with the contaminated towels inside were shaken by the hand for 2 minutes to dislodge the microorganisms into fluid. The contaminated napkins

were then removed aseptically from the bowls with sterile forceps and properly disposed-off.

Filtration unit comprising of Erlenmeyer flask, vacuum source and porous support were assembled and with the aid of a flame-sterilized forceps, a sterilized membrane filter was placed in position and secured with appropriate clamps in Millipore machine. 100ml of the contaminated fluid sample was aseptically poured into the upper funnel and suction applied to create a vacuum. After the sample was passed through the membrane filter, the filtration unit was taken apart and with the aid of a sterile forceps the membrane filter was placed in the Petri dish containing selective media for various parameters: M-FC for *Faecal coliform*, H-Chrome agar for *E. coli* and SS agar for *Salmonella* spp. Clamps, forceps were usually sterile prior to use for the next sample. All plates were incubated at position at $37\pm 2^{\circ}\text{C}$ for *Escherichia coli* and *Salmonella* spp. and $44\pm 2^{\circ}\text{C}$ for *Faecal coliform* at 18-24 hours. *Clostridium* spp. sample preparation, this was also done in accordance with APHA 9221D, the sampling bottle was shaken approximately 20 times previous to the analysis, 1ml was pipetted out of the sample fluid onto a sterile Petri dish and 10ml nutrient agar was poured onto it and the Petri dish was swirled clockwise and anticlockwise manner. It was finally maintained at approximately 37°C into each dish. Colonies were counted and identified

3.7 Data Analysis

The data collected, that is both qualitative and quantitative data, were analysed with the aid of Excel and Statistical Package for Social Scientists (SPSS) computer software to provide descriptive statistics such as standard deviations, regression analysis and the formation of frequency tables, plotting of pie charts, bar graphs etc.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Types of micro-organisms present in Napkins

Additionally, different species of bacteria were isolated from the various napkins that were collected from the food joints. The bacteria *genera* isolated include *Escherichia coli* and *Salmonella* spp. Table 1 below shows the different genera of bacteria isolated from the five different food joints located within Abirem and Afosu townships. *Escherichia coli* and *Salmonella* spp. were identified in almost all the food joints, where *faecal coliforms* and *Clostridium* spp. were also found to be totally absent in all the five food joints. For issues of confidentiality, the five vendors who allowed napkins samples to be taken from them for analysis were named A – E.

Table 1: micro-organisms isolated in napkin samples from the five food joints

Canteen	Type of microbes isolated
A	<i>Escherichia coli</i>
B	<i>Escherichia coli</i> , <i>Salmonella</i> spp.
C	<i>Escherichia coli</i> , <i>Salmonella</i> spp.
D	<i>Escherichia coli</i>
E	<i>Escherichia coli</i> , <i>Salmonella</i> spp.

Table 2: Mean of the different bacterial isolated from the various Food Joints

Canteen	<i>Faecal Coliforms</i> Log ₁₀ cfu/ml	<i>E. coli</i> Log ₁₀ cfu/ml	<i>Salmonella</i> spp. Log ₁₀ cfu/ml	<i>Clostridium</i> spp. Log ₁₀ cfu/ml
A	0	1.76	0	0
B	0	3.36	0.26	0
C	0	2.63	0.57	0
D	0	2.91	0	0
E	0	2.84	0.33	0

It could be observed from the table 2 above that, the mean of *Escherichia coli* was high

in almost all the food joints followed by the *Salmonella* spp. A prospective study conducted by Feglo & Sakyi (2008) among street food vendors in four bus terminals in Kumasi showed that there were bacterial counts on selected foods like fufu, red pepper, ice-kenkey, macaroni, and salad. The isolates obtained among other bacteria were negative staphylococcus aureus, faecal coliforms and staphylococcus aureus in unacceptable levels; Staphylococcus aureus (3.7%) and Escherichia coli (2.2%). A research by Boateng (2014) in Dunkwa- On Offin showed similar trend as micro-organisms were isolated in his study. The similarity between these two studies were as a result of the fact that, food vendors operated within similar settings, their knowledge levels were similar, prevailing defective environmental and personal hygiene conditions according to the studies.

Again, a study by Mensah et al, (2002), in Accra confirmed that factors such as poor environmental and personal hygiene, non-enforcement of food hygiene bye-laws, selling along gutters and poor hand washing practices were all identified to be factors responsible for the isolated bacteria in foods. Some of these factors create a congenial atmosphere for microbes to exist or multiply (Boateng, 2014).

Similarly, a study conducted in Santa Fe de Bogota, Colombia, on a group of food vendors by Buchanan et al in 1998 showed that 30 % of food vendors were carriers of pathogenic microorganisms including *Salmonella typhi*, *Staphylococcus aureus*, *Salmonella enteritidis* and *shigella*. This reflected in the high levels of *Escherichia coli*, *Staphylococcus aureus* in foods they sold (Boateng, 2014).

All the above studies focused on the microbial contents of food items sold on the streets whereas the current study focuses on the microbial contents of the napkins used by customers for cleaning their hands and lips after consuming these foods sold on the street. The truth is that, the means of inoculating these food items may not be separated

from that of the napkins. As a result, the presence of *Escherichia coli* of faecal origin was detected in all investigated food samples as well as napkin samples.

The street foods vendors, therefore, were found to have been providing napkins for use by consumers with threatening unacceptable microbial contamination levels.

It could be observed that, the level of *Escherichia coli* isolated was very high in almost all the canteens especially food joints B and D, the less was also recorded at food joint A. *Salmonella* spp. which was also found to be higher in food joint C and less at canteen B but absent in canteen A and D. However, no *faecal coliforms* and *Clostridium* spp. were isolated from the food joints.

Table 3: Total microbial load counted on the napkins from the various food joints

Week	Canteens	<i>Faecal coliform</i> Log ₁₀ cfu/ ml	<i>E. coli</i> Log ₁₀ cfu/ ml	<i>Salmonella</i> spp. Log ₁₀ cfu/m l	<i>Clostridium</i> m spp. Log ₁₀ cfu/ ml
Week 1		0	0	0	0
Week 2	A	0	2.44	0	0
Week 3		0	2.83	0	0
Week 1		0	3.71	0	0
Week 2	B	0	3.32	0.47	0
Week 3		0	3.04	0.30	0
Week 1		0	2.81	0.70	0
Week 2	C	0	2.57	1	0
Week 3		0	2.52	0	0
Week 1		0	2.66	0	0
Week 2		0	3.27	0	0
	D				
Week 3		0	2.79	0	0
Week 1		0	3.15	1	0
Week 2	E	0	2.08	0	0
Week 3		0	3.29	0	0

It could be observed from table 3 above that, the microbial load counted at canteen B was very high ranging from 3.04 to 3.71 for *E. coli* followed by canteen E, C, D and canteen A. Also, the microbial load was high at canteen C for *Salmonella* spp. ranging from 0 to 1 followed by canteen E and B.

The high presence of *E. coli* on contaminated napkins within all the canteens may be attributed to the improper washing of hands before and/or after meals (Nancy et al., 2008, Christian, 2013), since the hands consumers are always in direct contact with the surface of the napkins. The palm is usually wet or moist to varying degrees due to washing with water after meals or heat which is generated inside the hand, which contains sodium chloride that will sustain the growth of halophytic bacteria for example, *E. coli* (Elliot et al., 2001). Not all the microbial species which were under study were found in the canteens. *Clostridium* spp. and *Faecal coliforms* were absent in all the canteens (Fig. 1) this may be attributed to the rate of persistence of these bacteria on the environment.

Also, the level of microbial contamination of the other parameters varied from one canteen to the other with some recording high microbial load while others recorded low microbial load (table 3). All these might be due to the location of the different canteens, the hygienic conditions and the frequency of patronage by the users (Boateng, 2014; Ophelia, 2017). Some of these canteens are located at the door step of the users therefore easily accessed by the numerous users' and also the type of quality service offered while others have low patronage base on the distance and service provided. The more accessible these food joints are, the more diverse the type of microbes present and also the higher the level of contamination. Where there are a lot of people using these food joints, there is the likelihood for a good number of consumers to inoculate the napkins or having been inoculated, through the use of these contaminated napkins. New bacteria

may settle on the napkins from the air or through personal contact. This may account for the differences in microbial types and numbers among the different food joints. Also, the environmental conditions such as polluted environment where these napkins are kept after use could also be a factor, a variety of reservoirs in the environment can serve as a source of contamination (Christian, 2013).

The study also revealed again that the higher presence of *E. coli* and *Salmonella spp.* as shown, it could be attributed in part, to the fact that, *Salmonella spp.* and *E. coli* belong to the family of Enterobacteriaceae, they do not ferment lactose but most produce hydrogen sulphide or gas from carbohydrate fermentation, this promote their ability to survive in extreme weather conditions depending on their principal determinants of growth and " regrowth" (WHO, 2008; Christian, 2013). It can also be observed that the means of *E. coli* and *Salmonella spp.* were higher than 0 especially *E. coli* in almost all the food joints (table 3), in comparison with WHO and Ghana standard which is 0, shows that the napkins being used by consumers are contaminated. However, the contamination of these cloth napkins from the different food joints could not be concluded as higher or lower from one food joint to the other because factors such as the number of patronages and the frequency of the used of these napkins were not taken in to consideration in the study.

4.1.1 Potential health hazards

E. coli is found in large numbers in the environment and is present on the human body. Pathogenic strains of this species can cause urinary tract infections and travellers' diarrhoea (Fine et al., 1996; Nancy et al., 2008). Among the many strains of *E. coli*, only a few trigger diarrhoea. One group of *E. coli* which includes 0157:H7 produces a powerful toxin that damages the lining of the small intestine, which can cause bloody

diarrhoea (MFMER, 2013). You develop an *E. coli* infection when you ingest this strain of bacteria. Potential sources of exposure include contaminated food or water and person-to-person contact (MFMER, 2013; EPA, 2013).

Salmonella spp. which was also detected in three food joints may cause other serious infections in an immune compromised individual. Salmonella infections typically cause four clinical manifestation; gastroenteritis (ranging from mild to fulminate diarrhoea, nausea and vomiting), Salmonella are the cause of two diseases called Salmonellosis and enteric fever (typhoid), resulting from bacterial invasion of the blood stream and acute gastroenteritis, resulting from food borne infection/intoxication (Kenneth, 2009). Systemic infections caused by Salmonella enteric are public health problem especially in sub-Saharan Africa. Essentially typhoid fever is associated with high mortality particularly because of the increasing prevalence of multidrug-resistant strains. Thus, a rapid blood-culture based bacteria species diagnosis including an immediate sub-differentiation of the various samovars is mandatory (Kuhns et al., 2012). Kuhns et al., (2012), investigated the appropriateness of intact cell mass spectrometry (ICMS) to identify pathogenic bacteria derived from sub-Saharan Africa and tested the potential of this technology to discriminate *S. enteric subsp. Enteric serovar Typhi (S. typhi)* from other Serovars. Among the blood-cultured isolates obtained from a study of population suffering from febrile illness in Ghana, a detailed analysis of the mass spectra used for the analysis revealed several Serovars, specific biomarker ions allowing the discrimination of *S. Typhi* from others which is the main agent of typhoid fever. Potential sources of exposure include poor sanitation, personal contact handling or inadvertently by cross-contamination of water, food or food-contact surfaces in home or public environments (Christian, 2013).

Therefore, the presence of Salmonella spp. and the high occurrence of *E. coli* on cloth

napkins used by consumers of these food joints in Abirem and Afosu is a cause of concern because the microorganisms identified have potential pathogenic effects on the human immune system. Isolation of the bacteria from a contaminated surface is a clear indication the aseptic procedure by users is not effective in significantly reducing the level of the micro-organisms on the material and hand to acceptable levels.

4.2 Demographic Characteristics of Vendors

4.2.1 Demography of Vendors

The study found that out of the total sample of 203 food vendors, twelve, approximately (6%) were males and 191 approximately (94%) were females. This constituted a proportion of 1:16, which indicated that for every male, there were 16 more females who were food vendors in the study area. Out of the 62 vendors from Afosu, none of them was a male. In Abirem, however, 12 out of the 129 vendors were males. Abirem, the District Capital is gradually becoming cosmopolitan and demand for food is on the rise due to high number of government and mine workers, hence some men have started taking advantage of the situation and as such, diversifying their means. A development that needs to be encouraged since male food vendors are generally considered to serve, in most cases, hygienic foods to consumers. Situations in Abirem and Afosu are not different from what was presented by Ophelia (2017) from the Bolgatanga Municipality. However, similar studies by Boateng (2014) found that 90 percent of food vendors in Dunkwa-On-Offin in the Upper Denkyira East Municipality were females, which was encouraging in terms of men involvement in the business. According to Monney et al. (2014), Sunyani township has appreciable male population (14%) venturing into the food vending business than Bolga and New Abirem in the Birim North District of the Eastern Region. However, the trend is suggesting that the food vending business is dominated by females (Ophelia, 2017), which has strongly been supported by this current study.

4.2.2 Age of Vendors

Table 4: Age distribution of food vendors in Abirem and Afosu.

Age	Number	Percentage
18 – 27	32	15.7
28 -37	57	28
38 - 47	60	29.6
48 - 57	40	19.7
58 - 67	14	7

With respect to the age of the food vendors, it was found that none of them was a teenager. This study did not agree with that of Boateng (2014) and Ophelia (2017) who found out teenagers were involved in food vending business in Dunkwa-On Offin and Bolgatanga respectfully. Again 93% of the vendors were less than 58years, indicating that vendors in Abirem and Afosu in the Birim North District of the Eastern Region are within the working age group of Ghana. Monney et al. (2014) also found that the least represented in their sample of food vendors in Sunyani were teenagers, whereas the majority were those within the age brackets of 31-35 years.

The results of the current study therefore bear similarities to earlier studies, in terms of the majority of food vendors who are within the age limit of 28 and 47 years old. It is worth mentioning that parents in the Abirem and Afosu townships are now embracing education by allowing their wards of school going age to be in school. A development that may have been triggered by emergence of Newmont mining company in the towns through scholarships made available by the company to deserving students.

4.2.3. Educational Levels of Food Vendors in Abirem and Afosu**Table 5: Educational Levels of Food Vendors in Abirem and Afosu**

Education Level	Number	Percentage
Primary	39	19
JHS	31	15.2
Tech/Vocational	35	17
SHS	27	13.3
Tertiary	5	2.5
No Formal Education	66	32.5

The educational levels of the respondents were also explored, since some studies found that educational level of vendors is a significant determinant of the hygienic practices in food vending (Chukuezi, 2010; Dun Dery, 2012; Mensah et al. 2002; Monney et al., 2013; Ophelia, 2017). The current study revealed that 66 (32.5%) of the sampled food vendors had not attained any form of formal education. 39 (19%) have had only primary education, which covered school dropped outs. Both categories had no certificates to show. 31 (15.2%), 27 (13.3%), and 35 (17%) had completed Junior High School, Senior High School, and Technical/Vocational schools respectively and had various certificates to show. Only 5 (2.5%) of the respondents had gone through tertiary education level. Earlier studies that examined the educational attainment of food vendors presented mixed results. The Food and Agriculture Organisation (2012) found that a relevant number of Informal street food vendors had a secondary level of education (57% in Freetown, and 47% in Accra). Boateng (2014) found that the highest proportion of food vendors in Dunkwa-On-Offin were those with no formal education, whereas Monney et al. (2014) found that most of their respondents in Sunyani had only basic Education. According to Ophelia (2017), food vendors in the Bolgatanga Municipality usually had

only basic (Primary, JHS, SHS, and Tech/Voc) education as their highest level of educational attainment with only two per cent going through tertiary education system, with this current study not being exceptional. It is believed therefore, that, the higher the level of education among vendors, the higher the standard of hygienic practices since all the five vendors who have had tertiary education made sure they changed napkins for consumers after each use (field survey, 2020).

4.3 Management of Napkins by Vendors

4.3.1 Washing and Changing Frequencies of Napkins

Table 6: Depicting how often vendors wash their napkins (field survey, 2020)

Washing/Day	No of Vendors	% of Vendors
After each use	5	2.5
Four times	13	6.4
Two times	33	15.7
Once	153	75.4

Table 7: Depicting how often napkins were being changed for use by consumers

Napkin changing/Day	No of Vendors	% of Vendors
Change after each use	5	2.5
Change every 3 hours	13	6.4
Change twice	33	15.7
No change (same napkins)	153	75.4

From table 6 and 7 above, there exist a stronger correlation between the frequency of napkins wash and that of the likelihood for a consumer to use same napkin used previously or a different one. 153 (75.4%) out of the 203 vendors sampled, neither had

their napkins washed or changed for successive consumers within a day of selling. One can image how dirty such napkins would be considering the number of consumers visiting these food joints and the likelihood that each of them is a potential carrier of dirt and pathogens. 33 (15.7%) of the vendors had their napkins washed twice in a day and for that matter, a single napkin could be used for about 12 hours in a day by uncountable number of consumers before being changed. Depending on the patronage of the food joint, it is possible that huge number of consumers could contaminate the napkin before it is due for washing and change and same number could also go home with contaminated hands after wiping the hand with the already contaminated napkin. 13 (6.4%) of the vendors usually had their napkins washed and changed four times in a day. Though dependent on the number of patronages, it is believed that the microbial and dirt load on these napkins before changing would be minimal compared to the previous vendors. However, consumers visiting these food joints are at risk of carrying pathogens home and contaminating other surfaces they come into contact with. In contrast to these, 5 (2.5%) of the vendors had their napkins changed and washed for consumers after each use. They are the same vendors who have received tertiary education, and goes a long way to support the assertion by (Boateng, 2014, and Ophelia, 2017) that, rising educational levels amongst vendors, is directly proportional to the level of the standard of hygienic practices among vendors.

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4.3.2 Effectiveness of the methods of washing of Napkins by vendors

All the 203 food vendors sampled for this research work responded positively to the use of detergents in washing their napkins for use by their respective customers, with varying exposure rates of the napkins to detergents, sun, rinsing after washing. However, none of the vendors depended on mechanical means for drying napkins but rather were

dependent on the sun, whose effectiveness could be measured by the rate of exposure, intensity, and relative humidity of the atmosphere. Though detergents are generally known to kill germs (since bacteria are either gram positive or gram negative), it is worth mentioning that the period of exposure of these germs to detergents is critical in killing them. Again, with mesophiles and thermophiles bacteria, ordinary drying may not be able to kill these germs, which may only be possible during a longer period of drying on a shining day or rely mostly on mechanical means of drying.

From table 8 below, the periods of washing of napkins by vendors were assessed, and out of the total of 203 vendors, 130 (64%) used between 0 – 2mins to complete the washing process of a napkin. 47 (23%) completed within 3 – 5mins. 26 (13%) were observed to complete the washing process above 5mins. Additionally, 103 (51%) out of the 203 vendors do not rinse the napkins after washing. In effect, a number of napkins were being washed in a single bowl of water prior to drying, a development that could allow particles and pathogens to be carried along from one napkin to the other.

Table 8: Time spent by vendors to wash a napkin in minutes

Period of washing(mins)	No of Vendors	% of Vendors
0 – 2	130	64
3 – 5	47	23
Above 5	26	13

4.4. Storage of napkins by vendors prior to and after use by consumers

Table 9: Handling of napkins by vendors

Storage methods	Number of Vendors	% of Vendors
Folded on a plate	10	4.9
Folded on the dining table	5	2.5
Dumped on dining table	65	32
Hanged on the wall	69	34
Kept with the vendor	54	26.6

From table 9 above, 65 (32%) of vendors had their napkins dumped on the dining tables which were actively being used by consumers in wiping their hands and lips. These tables may serve as surfaces transmitting germs and particles to the napkins which in turns are being transferred to the innocent consumer. 69 (34%) hanged their napkins on the walls and at the entrance of the various eating places. Some of these napkins were at some points in time at some of the food joints, spotted being used by consumers who had yet not washed their hands but one way or the other got their hands stained either along the route to the food joints or at the time of waiting for their turns to be served. This possibly could have the napkins inoculated prior to use by consumers. 54 (26.6%) of the vendors had their napkins in their own custody which is being used by themselves to clean stained hands after serving and collecting monies from customers. These napkins are then transferred to consumers upon request which possibly could have their hands contaminated even before and after eating. Contaminated napkins, which could in turns, contaminate foods which can have severe consequences on the health of school children as children have poorly developed immunity compared to adults (Addo et al., 2018). Transfer of microorganisms by personnel particularly from hands, is vital in food vending business. During handling and preparation, bacteria are transferred from contaminated hands of food workers to food and subsequently to other surface

(Samakupa, 2003). Low infectious organisms such as Shigella and pathogenic Escherichia coli have been linked to hands as a source of contamination (Snyder, 1998). Poor hygiene, particularly deficient or absence of hand washing has been identified as the causative mode of transmission (Boateng-Acheampong, 2014). Diarrheal diseases due to contaminated and unhygienic condition of napkins are among the causes of illnesses in most communities and are linked to street foods such as fast foods (World Health Organization, 2009). According to a study by Waters (2019), consumers rarely get napkins at food joints which have been confirmed by the current study. They may sometimes hide the napkins behind the counter for reasons only known to them. It is indicative of how cheap and uncaring these food vendors are. 10 (4.9%) were observed having their napkins folded nicely and served to consumers on plates, a practice that is like to reduce napkins contamination.

4.5 Availability of Napkins at Food Joints (table 11, field survey)

Table 10: Availability of Napkins at Food Joints

No of napkins available (day)	No of Food Joints	% of Food Joints
1 – 2	119	58.6
3 – 4	30	14.8
5 – 6	21	10.3
7 – 8	15	7.4
9 – 10	10	5
Above 10	8	3.9

From the data garnered from the field, all the 203 food joints sampled for the purposes of this study had at least one napkin available at the time of data collection. From the table above, 119 (58.6%) food joints were stocked with at least one and at most two napkins. Though the current study did not take into account the number of consumers visiting these facilities on daily basis, it is a firm belief of the researcher that the ratio of a napkin

to consumers at these joints will be so wide. 30 food joints representing 14.8% had between 3 and 4 napkins for use on daily basis at the time of data collection. Again, 21 (10.3%) of the joints were providing between 5 and 6 napkins for use by consumers on a daily basis. 15 (7.4%), 10 (5%), and 8 (3.9%) were serving consumers with 7 and 8, 9 and 10, and above 10 napkins respectively on a daily basis. It has therefore, been established by this study that majority of the food joints sampled from Abirem and Afosu do not provide more than two napkins available for use by their numerous customers on a daily basis, a situation that is very worrying considering the high risks these joints pose to consumers when it comes to public health issues which are of great concern to many in recent days.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter draws the curtain on the research work. It has been desired to summarise the research work findings and draw conclusions based on the results gathered. The chapter finally ends with recommendations as well as areas for further research.

5.1 Summary of Major Findings

This study has shown that microbial contamination of napkins in some selected food joints in Abirem and Afosu townships in the Birim North District of the Eastern region is common. Sources of contamination have been found to range from the individuals (consumers and vendors) who used these napkins, how napkins were handled prior to and after use by consumers, ineffectiveness of the washing and drying methods of napkins, prolonged use of a single napkin by several consumers before it is either changed or washed, a very wide napkin to consumers ratio, fewer number of napkins available on daily basis for use by consumers, to the environment in which these napkins were kept. This study has shown the need for good hygienic practices by the operators of these food joints due to the multi-user -nature of their facilities, by making sure napkins made available for use by their prospective consumers are hygienic, free from pathogens, and do not serve as a media for inoculation of innocent consumers and their respective dependants.

5.2. Conclusion

The following conclusions can therefore be drawn;

- That there is microbial contamination of napkins in some selected food joints in

the study area.

- That the sources of contamination have been found to range from the individuals (consumers and vendors) who used these napkins, how napkins were handled before and after use by consumers and, ineffectiveness of the washing and drying methods of napkins.
- That there is continued use of a single napkin by a lot of consumers before it is either changed or washed, and there is very wide napkin to consumers ratio, fewer number of napkins available on daily basis for use by customers, to the atmosphere in which these napkins were kept.

5.3. Recommendations

1. Disposable napkins such as tissue papers are recommended for use by vendors or operators of these food joints in providing services to their clients. Where this is not feasible, Managers and operators are encouraged to have several napkins, washed properly, dried properly, change regularly after each use on daily basis, especially during the day to avoid overuse and contamination.
2. It is recommended by this study that, any available form of napkins, being it cloth napkin or tissue paper, must not be dumped on dining tables, hanged on walls and entrances of the dining area, kept in custody of the vendor which could only be released upon the request of the consumer, but rather be folded neatly and served on clean plates.
3. The regulators of the industry (Local Assemblies) must be seen leading in education, regulation, and monitoring of vendors and their businesses to ensure they operate in a safe environment through the enforcement of by-laws where offenders could be punished.
4. Proper hand washing under running water before and after meals should be

encouraged among consumers to avoid contamination of napkins and the subsequent spread of diseases.

5. Although there have been several documentations on studies in several parts of Ghana on hygienic conditions of foods being sold to consumers and of the hygienic practices among vendors, not much has been done in relation to the current study. I will therefore recommend that similar works are replicated in other parts of the country to aid us in a national discourse, in terms of awareness creation among consumers and the general public on the dangers of napkins use at food joints and policy formulation.

REFERENCES

- Addo, H. (2018). *Food Hygiene Awareness and Environmental Practices among Food Vendors in Basic Schools at Kintampo Township, Ghana*.
Doi:10.5923/j.fph.2018.0801.03
- Akanbanda, F, Hlortsi, E, & Owusu-Kwarteng, J. (2017). Food safety knowledge, attitudes and practices of institutional food-handlers in Ghana. *BMC Public Health, 17:40*.
- Aksoydan, E. (2007). Hygiene factors influencing customers' choice of dining-out units: Findings from a study of university academic staff. *Journal of Food Safety, 27(3)*, 300–316. doi:10.1111/jfs.2007.27.issue-3
- Amoah, M., Adonu, E. R. & Paintsil, E. (2018). The Level of Awareness of Fast Food Operators on Food Safety and Hygiene Practices. *Open Access Library Journal, 5(1)*, 1
- Angulo, F. J., Tippen, S., Sharp, D. J., Payne, B. J., Collier, Hill, J. E., Barrett, T. J., Clark R. M., Geldiech, E. E., Donnell, H. D & Swerdlow, D. L. (1997). Community waterborne outbreak of Salmonellosis and effectiveness of boil water order.
- Annor, G.A. & Baiden, E.A. (2011). Evaluation of food hygiene knowledge, attitudes and practices of food handlers in food business in Accra. *Food and nutrition sciences, 2*, 830-836.
- Antle, J. (2000). Efficient food safety regulation in the food manufacturing sector. *American Journal of Agricultural Economics, 78(2)*, 1242-1247.
- Apanga, S., Addah, J., & Sey, D. R. (2014). Food Safety Knowledge and Practice.
- Barber, N., & Scarcelli, J. M. (2009). Clean restrooms: How important are they to restaurant consumers? *Journal of Food service, 20(6)*, 309–320.

- Barber, N., & Scarcelli, J. M. (2010). Enhancing the assessment of tangible service quality through the creation of a cleanliness measurement scale. *Managing Service Quality*, 20(1), 70–88. doi:10.1108/09604521011011630
- Barber, N., Goodman, R. J., & Goh, B. K. (2011). Restaurant consumers repeat patronage: A service quality concern. *International Journal of Hospitality*
- Barolia, S. K., Verma, S. & Verma, B. K. (2011). Coliform contamination on different paper currency in Ajmer, Rajasthan, India. *Universal journal of Environmental Research and Technology*, 4:552-556.
- Bienstock, C. C. & DeMoranville, C. W. (2003). Organizational citizenship behavior and service quality. *Journal of Services Marketing* 17(4): 357-378.
- Birim North District Assembly (2006). *District Medium Term Development Plan*, an unpublished document.
- Bitner, M. J. (1992). Servicescapes: The impact of physical surroundings on customers and employees. *The Journal of Marketing*, 56(2), 57–71. doi:10.2307/1252042
- Boateng, E. A. (2014). *Assessment of food hygiene practices by street food vendors and microbial quality of selected foods sold: A study at Dunkwa- On-Offin, Upper Denkyira East municipality of the Central Region*. A thesis submitted to the Department of Community Health, College of Health Sciences in partial fulfillment of the requirements for the degree of MSc. Public Health.
- Campbell-Smith, G. (1967). *Marketing of the meal experience: A fundamental approach*. Guildford, UK: University of Surrey.
- Chukuezi, C. O. (2010). Food safety and hygienic practices of street food vendors in Owerri, Nigeria. *Studies in Sociology of Science*, 1, 50 – 57.
- Cynthia, E. S. (2015). *Food Safety Knowledge, Attitude and Practices of Chopbar workers in the Komenda Edina Eguafo Abirim Municipality of Ghana*. University

of Cape Coast.

- De Boer, E. & Heuvelink, A. E. (2008). Methods for detection and isolation of *Shiga toxin*-producing *Escherichia coli*. *Symp. Ser. Soc, APPL. Microbial.* (29), pp. 133-143. doi:10.1111/(ISSN)1748-0159
- Dulen, J. (1999). Quality control. *Restaurants and Institutions*, 109(5), 38–41.
- Elliot, T., Hastings, M. & Desselberger, U. (2001). Lecture notes on medical microbiology. Blackwell Publishing. 3rd edition.
- Environmental protection Agency (2013). Basic information about *E. coli*0157:H7 in drinking water.
- FAO (Food and Agricultural Organisation of the United Nations). (2010). INFOSAN Information Note No. 3/2010-Safety of street vended food. URL
- FAO (Food and Agricultural Organisation of the United Nations). (2013). Food for the Cities: Street foods. URL <http://www.fao.org/fcit/food-processing/street-foods/en/>.
- Fine, M. J., Smith, M. A., & Carson, C. A. (1996). Prognosis and outcomes of patients with community acquired pneumonia. A meta-analysis JAMA. 275(2), PP. 134-141.
- Food and Agriculture Organisation. (2012). *Organic agriculture and the law*. Accessed 20th October, 2012. www.fao.org/./i2718epdf.
- Food and Agriculture Organization. (2005). Important food issues.
- Food and Agriculture Organization. (2009). Good hygienic practices in the preparation and sale of street food in Africa: Tools for training. Rome: Food and Agricultural Organization of the United Nations.
- Foodlink (2004). Food safety definitions. Retrieved June 20, 2014 from www.foodlink.org.uk

- Griffith, C. J. (2000). Food safety: Where from and where to? *British Food Journal*, 108(1), 6-16.
- Harman, B., Benson, M. & Junger, A. (2004). Computer Keyboard and Mouse as a Reservoir of Pathogen in an intensive Care Unit *J Clin Moint Comp*. 18, pp. 7-12.
- Hospitality Management, 30(1), 38–45. doi:10.1016/j.ijhm.2010.04.001
http://www.who.int/foodsafety/fs_management/No_03_StreetFood_Jun10pdf.
- Kaiser, G. E. (2006). *II Bacteria growth and microbial metabolism: Factors that Influence Bacteria Growth*.
- Kotler, P. (1973). Atmospherics as a marketing tool. *Journal of Retailing*, 49, 48-64
- Kramer, C. (2006). Nosocomial pathogens persist on inanimate surfaces. A Systematic Review. *BMC Infectious Diseases. Management*, 30(2), 329 336.doi:10.1016/j.ijhm.2010.08.008
- Leach, J., Mercer, H., Stew, G., & Denyer, S. (2001). Improving food hygiene standards - a customer focused approach. *British Food Journal*, 103(4), 238-252. doi:10.1108/00070700110391335.
- Mensah, P., Armar-Klemesu, M., Hammond, A.S. & Nyarko, R. (2001). Bacteria Contaminants of Lettuce, Tomatoes Beef and Goat from the Accra Metropolis. *Ghana Medical Journal*, 33, 162-167.
- Miller, L. G. & Diep, B. A. (2008). Colonization, fomites, and virulences: Rethinking the pathogenesis of community-associated *methicillin-resistant Staphlococcus aureus* infections. *Clin. Infect. Dis.* 46, pp. 752-760.
- Mims, C., Dockrell, H. M., Geering, R. A., Rott, L., Wakelin, D. and Zuckerman, M. (2004). *Medical microbiology*. Elsevier Mosby. 3rd edition.
- Monney, I., Agyei, D., & Owusu, W. (2013). *Hygienic practices among food vendors in educational institutions in Ghana: A case of Konongo*. Foods,

2, 282-294.

Monny, I, Dominic, A, Badzi, S, Campaore, P. & Stephen, N. (2014). Food hygiene and safety practices among street food vendors: an assessment of compliance, institutional and legislative framework in Ghana. *Journal of Food and Public Health*, 4(6): 306-315.

Mulugeta, K, & Bayeh, A. (2012). The Sanitary Conditions of Food Service Establishments and Food Safety Knowledge and Practices of Food Handlers in Bahir Dar Town. *Ethiop J Health Sci*, Vol. 22, No. 1.

Nancy, P. Moreno, Barbara, Z., Tharp, M.S., Deanne B. Erdmann, M.S, Sonia Rahmati Clayton., James, P. & Denk, M.A (2008). The science of microbes. Microbes are everywhere.

Ntiforo, A. (2001). Street food situation in Ghana. Accra: Institute of Statistical, Social and Economic Research.

Opoku-Boateng, J. (2017). Personal hygiene in food businesses. Retrieved from <http://thebftonline.com/features/opinions/19617/personal-hygiene-in-food-businesses.html>

org/fsnforum/sites/default/files/resources/STREET%20FOOD%20VENDI
NG%20IN%20WEST%20AFRICAN%20COUNTRIESFinalVersion.pdf

Peach, L. & Thompson, D. (2017). *Health Service Catering: Hygiene*. (3rd Ed.), Her Majesty's Stationery Office, London.

Pettijohn, L. S. (2017). An evaluation of fast food restaurant satisfaction determinants, competitive comparisons and impact on future patronage. *Journal of Restaurant & Foodservice Marketing* 2(3): 3-20.

Quarmin, E. (2011). Safety of Fast Foods in Ghana: Ghana News Agency Feature (Accra). <http://www.ghanaweb.com>

- Ridgewell, J. (2016). *Examining Food and Nutrition*. Heineman Educational Publishers, Oxford.
- Rusin, P., Maxwell, S. & Gerba, C. (2002). Comparative Surface-to-Hand and Fingertip to mouth Transfer Efficiency of Gram-positive bacteria. Gram-negative bacteria and Plage. *Journey of Applied Microbiology*. 93, pp. 585-592.
- Samakupa, A. P (2003). *Hygiene indicators in a fish processing establishment, University of Namibia, Department of natural resource, Namibia*.
- Samakupa, A. P. (2003). Hygiene indicators in a fish processing establishment. *Thesis submitted to the University of Namibia, Department of natural resource, Namibia*.
- Scott, E., & Bloomfield, S. F. (2008). The Survival and Transfer of Microbial Contamination via Cloths, Hands and Utensils. *Journal of Applied Microbiology*. 68, pp. 271-278.
- Singh, D., A. K., & Talwar, A. (2010). Physical, Chemical and Bacteriological Study of water from Rivers of Uttarakhand. *Journal of Human Ecology*.32(3). pp. 162-173.
- Snyder, O.P (1998). *Food Safety: Applying HACCP for food safety assurance in 21st century*. Academic Press Ltd. London, UK 1001-1008.
- Snyder, O.P. (1998). *Food safety: Applying HACCP for food safety assurance in 21st century*. London: Academic Press Ltd.
- Strohl, W. A., Rouse, H. & Fischer, B. D. (2001). *Microbiology*. Lippincott Williams and Wilkins.
- Sunitha, C., Manjula, K., & Depur, B. (2011). Quality assessment of street foods in Tirumala. *Asian Journal of Experimental Biological Sciences*, 2, 207-211.
- Tagoe, D.N.A. & Kumi-Ansah, F. (2011). Computer Keyboard and Mice, Potential

- Sources of Disease Transmission and Infections. *Internet Journal of public health*. 1(6), pp. 453-458.
- Trickett, J. (2011). *The Prevention of Food Poisoning*. (2nd ed). Stanley Thornes Publishers Limited, Cheltenham.
- Tsuen-Hsui, T. (2015). "Paper and Printing". Joseph Needham, Science and Civilisation in China, Chemistry and Chemical Technology. 5 part 1. Cambridge University Press.
- Ungku Fatimah, U. Z. A., Boo, H. C., Sambasivan, M., & Salleh, R. (2011). Food service hygiene factors-The consumer perspective. *International Journal*.
- Waters, M. (2019). *Paper napkins are expensive and environmentally unsound. Now the industry is trying to save itself*. Retrieved from *Vox (website)*. Accessed: March, 4, 2020.
- WHO. (2012). Street food vending in West African cities: Potential and challenges. Retrieved on January 11, 2015 from <http://www.fao>.
- World Health Organization (2009) Increasing Impact through Collaboration: Food Borne Disease Stakeholders Meeting. http://www.who.int/foodsafety/foodborne_disease/FERG_Stakeholder_2008.pdf?ua=1 [5]
- World Health Organization. (2008). Guidelines for drinking-water quality incorporating 1st and 2nd addenda Vol. 1, Recommendations, 3rd Ed.
- Worsfold, D. (2006). Eating out: Consumer perceptions of food safety. *International Journal of Environmental Health Research*, 16(3), 229. doi: 10.1080/09603120600641417.
- Wuliyeng, G.T. (2013). Examining the Hygiene Practices Among Street Food Vendors in Nsawam and Adoagyiri. *Master's Thesis Submitted to University of Ghana*.
- Zeru, K., & Kumie, A. (2017). Sanitary conditions of food establishments in Mekelle

town, Tigray, North Ethiopia. *Ethiopian Journal of Health Development*, 2(1):1-9

APPENDICES

QUESTIONNAIRE

This questionnaire is designed to assess hygienic conditions of napkins used by consumers in some selected food joints in Abirem and Afosu in Birim North District. All information given on this questionnaire will be held confidential.

Names are not required on this questionnaire.

Please tick (), fill in the blank or write as appropriate to each question.

SERIAL NUMBER _____

SECTION A

DEMOGRAPHIC INFORMATION

1. Age

18-27 years []

28 -37years []

38- 47 years []

48-57 years []

58-67 years []

Specify, if otherwise _____

2. Sex

Male []

Female []

3. Level of education of food vendors

No formal education []

Primary school []

Vocational/Technical []

JHS []

SHS []

Tertiary []

SECTION B

NAPKIN HYGIENE PRACTICES

4. How often do you wash your napkins?

After each use []

Four times a day []

Twice a day []

Once a day []

5. How often do you change your napkin?

Change after each use []

Changed every 3 hours []

Changed twice daily []

Changed once daily []

6. How long does it take you to wash a napkin?

0 – 2 mins []

3 – 5 mins []

Above 5 mins []

7. How many napkins are available at your facility on a daily basis for use by consumers?

1 – 2 []

3 – 4 []

5 – 6 []

7 – 8 []

9 – 10 []

Above 10 []

SECTION C

OBSERVATIONAL GUIDE

Check list for evaluating napkins storage and handling by food vendors

SERIAL NUMBER _____

	YES	NO
1. Are napkins folded on plate	{ }	{ }
2. Are napkins folded on bare tables	{ }	{ }
3. Are napkins dumped on bare tables :	{ }	{ }
4. Are napkins hanged on the wall	{ }	{ }
5. Are napkins kept with the vendor	{ }	{ }

RESULT OF THE THREE SAMPLING

Table 1. Results of the first batch of napkin samples from the five selected food joints

Sample Id	<i>Faecal Coliform</i> (FC) (cfu/100ml) Method: APHA9222D	<i>E. coli.</i> (cfu/100ml) Method: APHA 9260F	<i>Clostridium</i> spp. (cfu/1ml) Method: APHA 9221D	<i>Salmonella</i> spp. (cfu/100) Method: APHA9265
A	0	0	0	1
B	0	5160	0	1
C	0	650	0	5

D	0	460	0	0
E	0	1395	0	10
Ghana Standards	0	0	500	0
WHO Guidelines	0	0	500	0

Table 2. Results of the second batch of napkin samples

Sample Id	<i>Faecal Coliform</i> (FC) (cfu/100ml) Method: APHA9222D	<i>E. coli.</i> (cfu/100ml) Method: APHA 9260F	<i>Clostridium</i> spp. (cfu/1ml) Method: APHA 9221D	<i>Salmonella</i> spp. (cfu/100) Method: APHA9265
A	0	275	0	1
B	0	2080	0	3
C	0	372	0	10
D	0	1860	0	1
E	0	120	0	1
Ghana Standards	0	0	500	0
WHO Guidelines	0	0	500	0

Table 3. Results of the third batch of napkin samples

Sample Id	<i>Faecal Coliform</i> (FC) (cfu/100ml) Method: APHA9222D	<i>E. coli.</i> (cfu/100ml) Method: APHA 9260F	<i>Clostridium</i> spp. (cfu/1ml) Method: APHA 9221D	<i>Salmonellas</i> spp. (cfu/100) Method: APHA9265
A	0	670	0	0
B	0	1103	0	2
C	0	331	0	0
D	0	610	0	0
E	0	1956	0	1
Ghana Standards	0	0	500	0
WHO Guidelines	0	0	500	0

