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Hygienic and Sanitary Practices among Street Food Vendors - Sagnarigu Municipality of Northern Region, Ghana, 2020

Abu Issahaku[1*], Kofi O. Adoma[2], Bawa G. Sidiqque[3]
[1]Catholic University of Ghana, Fiapre, Sunyani, Ghana
[2]University of Health and Allied Sciences, School of Public Health, Hohoe, Ghana
[3]Kalpohin Senior High School, Department of Food Sciences, Tamale, Ghana

ABSTRACT

Street food vending is a popular income generation activity in developing countries, especially in most cities and towns. Street food vendors normally operate under conditions that could expose consumers to foodborne illnesses. The main objective of the study was to assess sanitary and hygiene practices of street food vendors in the Sagnarigu Municipality. A descriptive cross-sectional study was adopted, questionnaire and multistage sampling technique used, involving purposive and simple random sampling techniques to arrive at a sample size of 270 street food vendors. SPSS was used for data analysis. Univariate and bivariate analyses were conducted. Majority (94.1%) of respondents were females, 32.6% had no formal education, and 39.6% were in the business for 2-3 years. About 81.9% of vending sites were located by the road side, 60.9% close to open gutters, 98.9% of the participants held money with bare hands as well as food. Most of the participants (95.2%) were not wearing face masks, no apron used (90.0%). Also, about 65.2% did not have professional training, no periodic medical examinations (75.9%), no medical certificate to show (83%), and 98.5% had no food safety manual available. Level of respondents' education showed a significant relationship with location of vending site, waste bin availability at site, frequency to which water used to wash utensils was changed, handling money with bare hands when handling food, provision of veronica bucket at vending site, professional training and licensed to operate as food vendor. The study recommends that Environmental Health Officers may have to consider conducting regular visits to street food vending sites to ensure that high food safety standards were upheld. The study further recommends that the Ghana Education Service (GES) increases school enrolment and girls in particular so as to have more educated people in the future in the food business.

Keywords: Street Food Vendors, Foodborne Illness, Vending Sites, Sanitary and Hygienic Practices

CHAPTER ONE: INTRODUCTION

Background of the Study

The World Health Organization [WHO] (2006) defines street food as foods and drinks cooked or processed and vended along thoroughfares and other community centers for public patronage. The street vending is an primitive practice (Cortese *et al*., 2016), regular in many countries (WHO, 1996) as a means of livelihood. As a result of inadequate facilities and strong systems, including water, and improper waste disposal processes, the sanitary quality of street food vending sites may be compromised. The global community has implored upon member countries to enhance the wholesomeness of food sold to the public along the streets and other public places, highlighting all stages of the agriculture value chain, starting from harvest, processing, storage, distribution, all the way to preparation and consumption. This is due to the

* Abu Issahaku

fast emergence of foodborne illness and the sufferance it causes the public (FAO/WHO, 2018). In a quiet recent conference by WHO/FAO/AU in Ethiopia, it was estimated that 600 million cases and 42,000 deaths from foodborne illnesses arise annually to consumption of unsafe food which is now a threat to human health and economies (FAO/WHO/AU Int. conference, 2019). In a similar study conducted by Eliku (2016), revealed that the superiority of the basic material, how food was managed, including storage were are a major factors that pose potential danger to patrons of street foods.

Across the world, some studies have also gone into this area, all in an attempt to improve the situation and the health of the masses that patronize street foods as well as the general public as a whole. For instance, in the United states of America, a study on street food activities recommended there should be the enforcement the various rules and regulations to ensure that food service providers at the streets adhere to safety standards (Cardoso *et al.,* 2014). It was further estimated that supportive monitoring and supervision can also help achieve compliance in the industry (Aluko *et al.,* 2014).

A study by Ababio *et al.* (2015), recommended that governments should strengthen regulation on street food vending activities, there should be frequent food handling training instituted for food service providers, as well as government facilitating the growth medium-small scale enterprises. In another study, the recommendation was for government to ensure continuous education and strengthen policy on the activities of street foods (Dun-dery & Addo, 2016).

It has been established that, majority of food service providers and the patrons alike were said to be indifferent about hygienic practices but rather concerned about the attraction established between them based on the face value, the attractiveness of the food, thus appearing to have their respective appreciation of what defines the safety and quality of food (Haleegoah *et al.*, 2015). The safety is said to largely hinge on proper regulation of the vendors, unfortunately in many cases there exist inadequate regulation about the operations of street food sellers. Research reports of limited visibility of food safety officers in fulfilling their oversight responsibilities, to ensure that food hygiene regulations were implemented to the latter (Kibret & Abera, 2012). Similarly, the non-existence of education regimes on food handling practices which are key to ensuring safety standards were also said to be rife among food service providers (Okojie & Isah, 2014). According to a study in Kumasi, street food safety is driven by many determinants such as education and awareness of food safety protocols, poor food hygiene and poor economic capacity of food vendors, defiance of food vendors towards food safety, socio-cultural dogmas and trust, ineffectiveness various food safety regulatory bodies (Rheinländer *et al*., 2008). This study aimed at assessing further, the sanitary factors along with hygienic practices of street food vendors, in order to come out with recommendations to authorities towards improving the waste disposal situation at food vending sites and to reduce the dangers associated with it.

Problem Statement

Street food service business is a popular income generation activity in developing countries, and a popular characteristic of several cities and towns in underdeveloped countries. Street food vendors normally operate under conditions that could expose consumers to foodborne illnesses (Eliku, 2016). Research has shown that food safety practices among vendors have not been encouraging across the globe, especially in developing countries. It is reported in Nigeria that, up to 91.90% of street food vendors were women and all handled money while serving food with same hands (Aluko *et al*., 2014). Also, among street food vendors in Ethiopia 78.8% of street food vendors were females and 100% of street vendors handled money with bare hands while serving food which is a bad practice and not safe. Another worrisome thing being a large proportion (68.5%) of vendors having primary or no

education at all, which is a potential for limiting their knowledge on food safety practices (Eliku, 2016).

Sagnarigu Municipality is a fast growing area and with increasing population, there is increase demand for fast foods for the busy people and school children and their families (SMA, 2018). However, the quality and safety of these foods are in doubt following the municipality being ranked to the bottom of 36 other MMDAs within the northern region in 2018 First Half Year as well as 23 out of the 26 Metropolitan/Municipal/District Assemblies (MMDAs) at the 2018 Annual ranking as the worst in terms of the practice of open defecation (SMA, 2018). This could lead to breeding of house flies that could carry human excreta to food preparations sites and contaminate foods with little chance of exposure (SMA, 2018).

The level of awareness and for that matter the level of formal education of the street food vendor may largely influence the sanitary and hygiene practices of the vendors, and their adherence to safety standards. It is reported that professional training and formal education had some significance on how food was managed by those who sell foods along thoroughfares and other public places (Rahman *et al*., 2012). In spite of all these, there exist little knowledge about how food is handled by people who sell food along the streets and public places in the Sagnarigu Municipality, which is not entirely different from other parts of the country, hence the motivation behind this research.

The Sagnarigu Municipality in the past three (3) years have recorded a continuous increase in diarrhea diseases. The trend is displayed in the following table:

Year	2015	2016	2017	2018	2019
Number of cases	3588	4666	4331	7558	8314

Source: (DHIMS data, 2019)

The fact that the Sagnarigu municipality has been ranked at the bottom consistently in open defecation free district rankings, diarrheal diseases have persistently been on the rise, and most gutters along the streets were left opened, coupled with the fast establishments of street food vending sites. Thus, it was prudent to conduct this study, to assess the sanitary and hygienic practices of street food vendors in the Sagnarigu Municipality. This ensured that necessary recommendations were made on waste management and hygiene practices to promote the quality of foods churned out by food service providers at the streets, which would ultimately enhance the health and overall wellbeing of the populace.

Justification of the Study

Street food vending is fast growing in areas that are fast becoming urbanized as could be said of Sagnarigu Municipality. Report from the Northern Regional Urban Roads Department suggested most of the gutters constructed along major streets are left open (SMA, 2018). This gives way for people to dump all sort of refuse inside these gutters including human excreta. In 2004, there was a cholera outbreak in the municipality of which 2 of the 3 confirmed cases were from one house (SMHD, 2018). This increasing trend in diarrhea cases over the years, coupled with reports from several studies regarding the low adherence to food handling standards among street food vendors across most continents could be said to be testimonies that much attention was needed for that economic venture in order to promote public wellbeing. With cognizance of the huge population proportion patronizing the services of food sellers along the streets of Sagnarigu Municipality and Ghana at large, it was imperative to research into the safety of foods among street food vendors. Recommendations could be made for appropriate stakeholder intervention to ensure that food sold by street food vendors are nutritious and safe for consumption. Therefore, it is for these and other reasons that spurred the

research on to embark on this research to unravel the hygienic and safety practices among street food vendors.

Research Questions

The following are the research questions upon which the objectives of the study were formulated.

i. Does the level of education have significant impact on the various food safety?
ii. What are the sanitation practices of street food vendors in the Sagnarigu Municipality?
iii. What are the hygiene practices of street food vendors in the Sagnarigu Municipality?
iv. What is the level of adherence to safety standards by street food vendors?

Objectives of the Study

General Objective

The main objective of the study is to assess hygienic and sanitary practices of street food vendors in the Sagnarigu Municipality.

Specific Objectives

The specific objectives of the study are to:

i. Assess the sanitation practices of street food vendors in the Sagnarigu Municipality
ii. Assess the hygiene practices of street food vendors in the Sagnarigu Municipality
iii. Ascertain the level of adherence to safety standards by street food vendors in the Sagnarigu Municipality
iv. Assess the association between level of education of food vendors and various food safety parameters

Significance of the Study

This study seeks to unravel more of the issues about street food vendors and the possible interventions that could be put in place to improve the sanitation and handling practices of this fast growing business in Sagnarigu Municipality. Recommendations when implemented may at the end of the day minimize diarrhea cases in the municipality and Ghana at large. Attention of relevant institutions that have a part to play such at the Environmental and Sanitation Department and Department of High Ways could be drawn in the recommendations for them to intervene and improve the situation along the roads in the municipality so as to make it safer for the street vending business.

Several researches have come out with recommendations directed at relevant authorities all with the aim of changing happenings at the food industry. A study by Ababio *et al*. (2015), suggests that, many recommendations that included suggestions to authorities to regulate the General Hygiene Principles, frequent food care education for food service providers in respect of their roles. Government's assistance for small scale establishments and food handler's health screening were as well recommended. In another study, it was found that education and continue training was needed to improve their ability to provide better food services at the streets (Alqurashi *et al.,* 2019).

Conceptual Framework

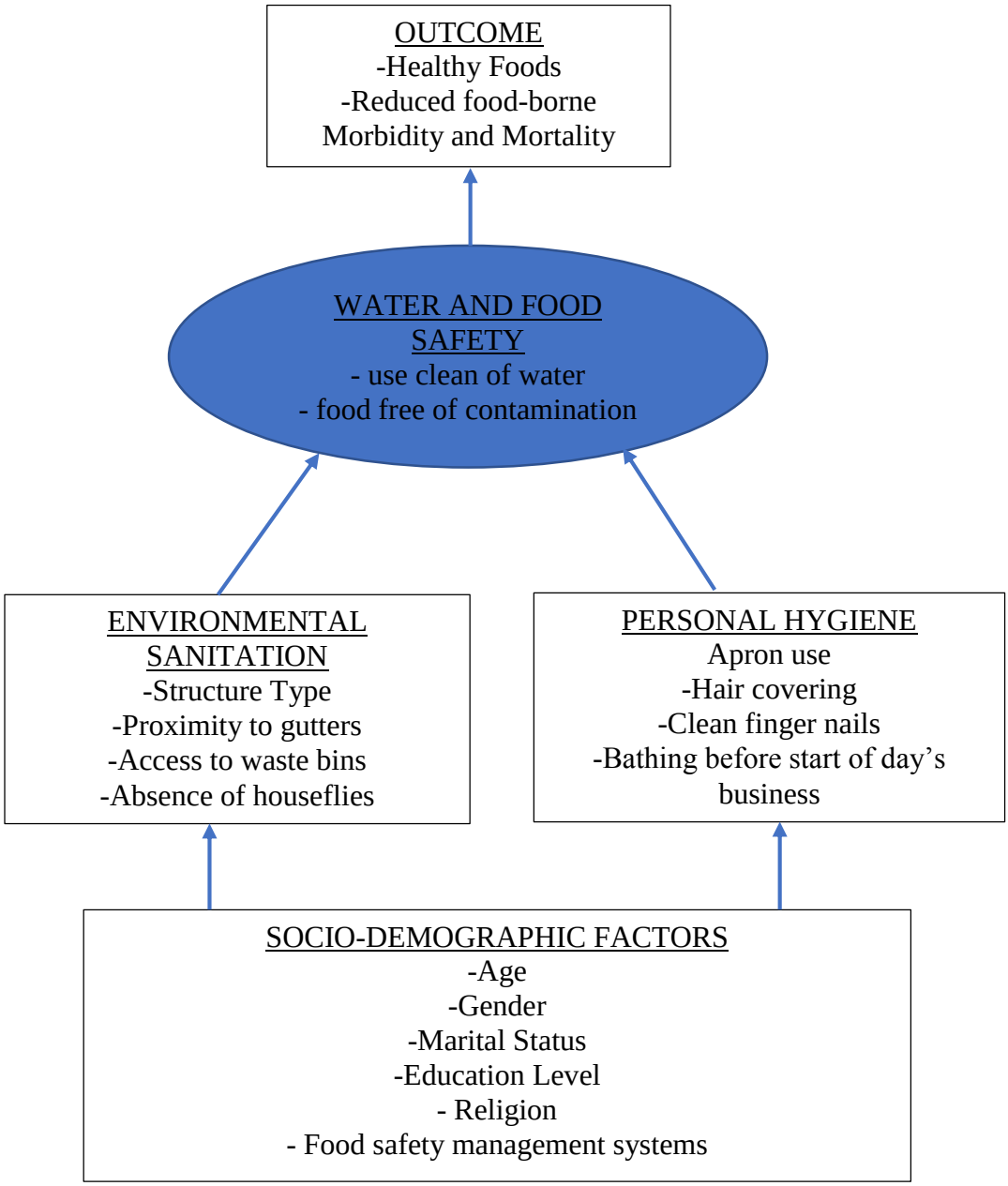

Figure 1: Conceptual framework of the study (Adopted from Hill *et al.*, 2019)

Street food safety is driven by interrelated factors such as, knowledge and awareness of food safety measures, poor food hygiene and low socioeconomic status of food vendors, poor attitude of food vendors towards food safety, socio-cultural beliefs and trust, as well as ineffectiveness of agencies responsible for enforcing the regulations governing the operations of food service providers (Rheinländer *et al*., 2008).

The importance of compliance to food safety regulatory requirements by street food vendors to prevent all forms of public health threats cannot be overemphasized. Chapman *et al*. (2010), reports that street foods have a link to approximately 70% of disease outbreaks. Achieving a reduction in foodborne morbidity and mortality through safe foods is largely a

function of multiple interlinking factors such socio-demographic characteristics, environmental sanitation, personal hygiene as well as quality water and food.

The demographic characteristics of those who are involved in street food vending are deemed fundamental in the safety of foods they deliver. The level of education, professional training, marital status among other things of the food provided are said to have a connection with adherence to laid down food service standards, including the environmental health habits. For instance, though the level of formal education attained by the food vendor is considered to have direct positive effect on good hygiene practices, it is low among food handlers in Ghana (Ackah *et al.*, 2011).

Further, the existence of functioning food management systems could be significant in promoting food safety among food handlers. Though there are a number of food safety laws and regulatory bodies the enforcement of the laws cannot be said to be implemented with its full force. According to Ababio & Adi (2012), the existence of inadequate food control systems throughout Ghana, with small and micro enterprises deemed to lack the competence to execute and foster satisfactory global yardsticks. It reported that the food producers and processors throughout the world largely had food safety control systems instituted to prove their support for the established laws and consumer service requirement (Ababio & Adi, 2012).

Food safety is considered to be largely dependent on environmental sanitation and hygiene practices. There exists an exponential increase in the consumption of food prepared outside the home, though there is a greater risk exposure to poor hygiene in commercial food service settings (World Health Organization, 2008). The level to which food vendors keep the immediate surroundings of the vending site clean and ensure proper hygiene practices define the extent to which their foods can be said to be safe for consumption. Research however points out that hygiene practices were below standard among food vendors (Feglo & Sakyi, 2012). According to Eliku (2016), due to inconsistent supply of tap water, street food vendors are obliged to use unclean water for cooking and washing their utensils which poses as a health risk to consumers. The study further added that some street foods are prepared in dirty environment with waste water and refuse dumped nearby, that serves as breeding ground for rodents and also bad smell.

The context of safe food handling practices is shaped by a number of factors that include vending experiences, personal hygiene, cultural characteristics, availability of resources and the vending environment. For instance, lack of running water, poor sanitary conditions, and improper food handing have been associated with food borne illnesses such as diarrhea, vomiting, abdominal cramps and nausea (Ossai, 2012).

The ultimate goal in ensuring environmental sanitation and hygiene practices is safe foods for consumption, and ultimately reduced foodborne morbidity and mortality.

Organization of Chapters

The research work is organized into six chapters. Chapter one contains introduction to the study which includes the background and problem statement. Chapter two is the literature review session which sought to explore works done by others on similar topics and at different locations across the globe to the one we are currently conducting in Sagnarigu. Chapter three is Methodology, which narrates the format used to arrive at the results. Items under this included study design, study population, sampling technique and sample size, study variables, data collection tool, data analysis, limitations of the study and ethical consideration. Chapter four is on data analysis, where data e presented in tables and charts. Chapter five made the discussion session, while chapter six contained conclusions and recommendations of the study.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents review of scholarly works on sanitary and hygiene rehearses of street food vendors, having to do with the location of the food vending site and waste management, as well as personal and kitchen hygiene practices. It also looked at food vendors' adherence to food safety standards, regarding professional training, medical examination and regulatory bodies. The associated factors, such as demographic characteristics to sanitary and hygienic practices as well as adherence to safety standards among street food vendors were also looked.

Sanitary Practices of Street Food Vendors

Street foods are ready-to-eat (RTE) foods and beverages that are sometimes prepared by vendors in the streets and oother public places, and mostly sold to consumers for immediate or later consumption without any further preparation or processing (Imathiu, 2017). According to Muyanja *et al.* (2011), street food selling is a flourishing livelihoodood venture, especially countries with fast developing economies, and is becoming one area of much interest to well-meaning business people globally, as it generates income in many of the low-income households. Billions of people are at risk and millions fall ill every year; thousands die as a result of consuming unsafe food (Akabanda *et al.*, 2017). The World Health Organization (WHO) and European Union (EU) are reported to consent that, community measures such as food safety, food hygiene and water safety should be re-looked intoo amidst a scientific knowledge that is key in addressing food borne prevention (Moreb *et al.*, 2017).

In Sagnarigu Municipal, approximating other evolving cities, street food vending is one the means of income generation and women play a dominant role in this sector. Street-vended foods or street foods are those foods and beverages that are prepared and or sold by vendors on the street and other public places for immediate consumption or for consumption at a later time without further processing or preparation (WHO, 1996). Food treatment and storage actions are major factors that upset the security of street foods. Due to difficulty in access to water in most developing cities and towns, street food vendors are compelled to use unclean water for cooking and washing their utensil which leads to health risk to consumers. Other activities of street food vendors such as ooperating under dreadful environmental conditions, such as presence of insects, gaseous pollutants from air, dirt particles, domestic animals, all upsurge the menace of food pollution to the public (Eliku, 2016). Typically, street vendors face common challenges which range from neglect to poverty rights (right to and impact on health of otheirs), and various forms of harassment from civic authorities to the subsistent living practices. Despite all these harassment, the street vending business is fast growing (Nittaya, 2013).

However, due too the informal nature of this industry, their activities do not receive much regulation from authorities. This gives the chance for some unwholesome practices to go on unnoticed. The consequences of this is unbearable risk posed the health and safety of practitioners in the value chain (Adegbemiro, 2016). There have alsoo been the issues of noncompliance to food safety standards reported about street food vendors in some countries, and it is very important to identify instances of noncompliance for street food vending sites and to develop real remedial actions. There should also be procedures put in place to control the hygiene of street food vendors (Czarniecka-Skubina *et al.*, 2018).

Hygiene Practices

A study in Nigeria revealed that, the observed food handling practices among street food vendors interviewed had nearly 47.6% of serving food with bare hands (Chukuezi, 2010). Similarly, it was reported in Ghana that, almost two-thirds of street food vendors used their bare hands to serve food (Monney *et al*., 2014). Based on the researcher's oobservation on food handling practices of street food vendors in the study in Polokwane Central Business District, 76.1% of street vendors were handling food with their bare hands, while less than half of the street food vendors were oobserved to have cleaned their utensils adequately after every use with soapy water. Alsoo, 84.2% of the street food vendors were oobserved to be handling food while subsequently handling money (Marutha & Chelule, 2020).

The European Parliament and regulation council of 29th April 2004 on the hygiene of food staffs, came with recommended guidelines for street food vendors to be followed to ensure food safety. Some of the regulations includes; the use of portable or clean water, whenever necessary to prevent contamination; ensure that staff handling food are of good health and undergoo training on health risk; to keep clean, and where necessary after cleaning, to disinfect in appropriate manner, facilities, equipment, and containers (CAC, 2003). It is reported that, the use of unsafe water for cleaning and processing of food, poor food production processes and food-handling, absence of adequate food storage infrastructure and inadequate or poorly enforced regulatory standards aggravate the burden of food borne diseases (Tessema *et al.,* 2014), and these according to Adane *et al*. (2018) may be due to the characteristics of environmental conditions of street food vendors in low-income countries like Ethiopia.

Adherence to Food Safety Standards

The World Health Organization's *Five Keys to Safer Food* highlights that street food ought to be prepared and served under good environmental conditions, and in doing so, food vendors must maintain good personal hygiene, separate raw and cooked foods, cook foods thoroughly, keep foods at safe temperatures and use both safe water and safe raw materials. This policy is said to have achieved results in many WHO nations (Mwamakamba *et al.*, 2012). According to Marutha & Chelule (2020), 75.4% of the street food vendors interviewed in Polokwane Central Business District believed that formal training on food safety was necessary for their business purposes, while according to the report 16.2% responded otherwise.

Association between Level of Education and Various food Safety Parameters

The age of a person managing food vending site could be crucial to the success of the operations of the business to a large extent. Research had it that the involvement in street food vending cuts across all age groups. A number of researches reports majority of street food vendors as having their ages in the range of 40-59 years (Cortese *et al*., 2016; Franklyn & Badrie, 2015). The age range of 23-49 years appears to be the commonest age range among street food vendors as reported in numerous studies (Ahmed *et al*., 2017; Chukuezi, 2010; Monney *et al*., 2013; Nurudeen *et al*., 2014). In all these studies reviewed, little was mentioned of teenagers in the street vending industry even though, in rare ooccasions teenagers are involved. The food services industry appeared to be dominated by females according to research. Literature highlights female dominance in the street food business with men sometimes being seen ooccasionally preparing a special kind of food. The vast majority of

street food vendors interviewed in several studies were found to be females (Franklyn & Badrie, 2015; Muyanja *et al.*, 2011).

A study in Bauchi Metropolis of Nigeria revealed a low level of education with as much as 92.3% of street food vendors, nonattendance of food hygiene training (81.3%), 82% of uncertified food businesses, 91% of the food vendors had good levels of knowledge regarding food hygiene, good attitude towards food hygiene (93%) and good food hygiene practice (90.3%). The study further revealed in a chi-square test of association that food hygiene training ($p = 0.015$), knowledge regarding food hygiene ($p = 0.002$) and attitude towards food hygiene ($p = 0.040$) were associated with street food vendors' food hygiene practices (Yahaya *et al*., 2018).

Summary of Chapter

From the literature, street food business is fast growing across the length and breadth of the world with increasing urbanization. The business is dominated by females though some particular foods are mostly sold by males. Age wise, the middle aged from early thirties (30s) to fifties (50s) dominate the industry though average age varies across continents. Much relatively younger ages are involved in some countries like India but little is heard about teenagers in the whole industry though it happens on rare ooccasions. On hygienic and food handling practices, majority of studies report is not the best and call on the need for improvement. Most prominent areas on insanitary practices have to do with vendors handling money while serving food and some too not washing hands after visiting toilet. Others barely wash the hands with only water and no soap. Availability of safe water for cooking and washing of utensils is an issue at most places. This led to most vendors using dirty water and recycle water to wash utensils. Some food vendors operate under unapproved structures that lack maintenance and sanity.

Adherence to safety standards is equally a challenge across all countries but is clear from most of the studies that the relevant authority that are supposed to ensure street food vendors abide by certain practices themselves are not doing much to ensure conformity. They barely sit by and watch with little or no intervention most times. Another very crucial area of oobservation is environmental cleanliness which equally needs improvement across all studies. One would have expected that the developed countries set the pace for the developing countries to follow but it seems the inadequate attention paid by authority on the practices gives them freedom to mess up their immediate environment with the waist generated. The study alsoo equally sought to seek and association between professional training and level of education on hygiene and sanitary practices of street food vendors. The few researches available in that suggest some relationship does exist and recommend professional training for food vendors.

In conclusion, most researches conducted in this area reveal one lapse or the oother with activities of street food vendors. Recommendations already made from these studies and those yet to emerge from current and future researches such as this particular one being conducted in Sagnarigu, when implemented could in the long run better performance of street food vendors and also ensure delivery of safety foods to the general public.

CHAPTER THREE: RESEARCH METHODOLOGY

This section presented methods of the study, thus, the systematic way in which the research was addressed. It covers the background of the study area, study design, study population, sampling technique and sample size, study variables, data collection tools, data analysis, study limitations and ethical considerations of the entire research process.

Background of the Study Area

Sagnarigu Municipality is bounded to the north by Savelugu Municipality, to the south by Tamale Metro, to the West by Kumbungu district, to the East by Naton district and to south west by Tolon district. The Municipality have been zoned into six sub municipals with a total of forty-three (43) (health facilities) that provide health care services to the population of 178825 as projected from the 2010 Population and Housing Census. Though the municipality play host to a number of schools including 2 colleges of education, technical university, UDS city campus, 4 public senior high schools and a host of basic, the illiteracy level remains very high in the area, with very 70% of the populates being illiterates. The municipality is one of the poorest in the northern region with a dependency ratio of 0.754 (75.4%). The Economy of the people is largely subsistence with Agriculture being their main occupation. The Municipality is indulged with prospective especially in the areas of Agriculture, as the land is suitable for the cultivation of cereals, tubers and rearing of animals that could support the nutrition needs of the public. Other economic activities include food vending, weaving, agroo-processing (Shea butter extraction), meat processing, fish mongering, wholesale and retail of general goods, transport and many oothers.

Study Design and Type

The study adopted the descriptive cross-sectional study design. This design is a study design in which the disease or condition and potentially related factors are measured at a specific point in time for a defined population. This type of data can be used to assess the prevalence of conditions in a population. It was alsoo quantitative-based cross-sectional designs, using data to make statistical inferences about the population of interest or to compare subgroups within a population. The qualitative-based designs focus on interpretive descriptive accounts of a population under oobservation. This study design is oobservational in nature, does not establish causal relationships and prune to report biases. It offered the opportunity to look at data from the study population at the specific time. It allows for multiple variables to be considered, and provides a springboard for further study. Alsoo, considering resource constraints and the short time allotted for this study, the cross-sectional study design was deemed appropriate, as it is generally faster and inexpensive compared with other study designs. Therefore, it ensured that the prevailing characteristics of food sellers along the streets in Sagnarigu Municipality, such as socio-demographic characteristics, hygiene and sanitation practices, and level of adherence to safety standards were assessed within the period.

Study Population

The study population constituted all food vendors along the streets of the four sub-municipals of Sagnarigu Municipality. They included both ready-to-use food vendors and vendors of foods that were needed for further processing. These food vendors sell food to the

people in the Municipality and could be a potential source of infection to people and contribute to poor sanitary conditions.

Sampling Technique and Sample Size

A multistage sampling technique was used for data sampling in the study. A two-staged sampling procedure was used to arrive at data collection. The first stage involved dividing the municipality into six sub municipals as carved out by Ghana Health Service (GHS). Of the six sub municipals, twoo of them were typically rural and had low food vending activity (SMA 2018). In view of this, the four sub municipals within the Sagnarigu Municipality which had similar level of food vending activity, spatial distribution and read network were purposively included in the study. The second stage involved the random selection of 67 street food vendors in each sub-municipal based on even distribution of the sample size of 270, with the remainder of 2 added to Sagnarigu and Choggu sub-municipals which represents the core of the municipality. Street food vendors in each sub sub-municipalities were identified and each given a given a code. These codes were then written on pieces of paper per the respective sub-municipality and folded. These folded pieces of paper in a particular sub-municipality were then dropped in an opaque box, and shaken properly to mix up. The hand was then dipped into the box one after the oother until the required number of street food vendors in a particular sub-municipality were picked. By the assigned codes on the randomly selected sheets of paper, the specific food vendors were identified and interviewed in each area.

For determining the sample size, the Yamane formula of sample size calculation derived from the Cochran method of sample size determination.

Sample size was arrived at by calculation are as follows:

$$n = \frac{N}{1 + Ne^2}$$

Where, N= population of food vendors at the municipality from survey = 715, according to a survey report by the municipal environmental ooffice, e = margin of error = 0.05, and a desired confidence level of 95%.

$$\Rightarrow \quad n = \frac{715}{1+715\ (0.05)^2} = \frac{715}{2.7875} = 256.5 = 257$$

Adding non-response of 5% to the total of 257 street food vendors resulted in 257+13 = 270. Even though literature reviewed so far suggest no study has recorded non-response rate of up to 5%, we still deem it necessary because of location and cultural variations. Therefore, 270 street food vendors were targeted for the study.

Study Variables

This study had two main variables, namely; dependent and independent variables, as captured in the table below with their ooperational definitions.

Dependent Variables	**Independent Variables**
The dependent variables of the study included sanitary, hygiene and food safety standard practices	The independent variables of the study included sociodemographic characteristics and professional training of street food vendors.

Sanitary Practices	**Sociodemographic Characteristics**
Location of vending site: refers to whether the vending site was located at the road side or away from road side. **Designated structures**: refers to whether food was being sold in structures such as stalls or not. **Vending site clean enough**: this refers to the extent to which the vending site was free from filth at the time of the study. **Availability of waste bins**: refers to whether or not vending site had waste bins available for waste collection. **Gutter at vending site**: refers to the closeness of a gutter to vending site. **Nature of gutter**: refers to the nature of gutter located at vending site, whether oopened or closed. Refuse dump site: this refers to the actual refuse dump site of the food vendor.	**Sex**: refers to the state of the street food vendor being a male or female. **Educational level**: refers to the educational status of the respondent at the time of the interview, in terms of no formal education, basic, SHS/Vocational/Technical and tertiary education. **Age**: refers to the completed years of the respondent at the time of the interview. **Marital status**: refers to whether the respondent at the time of the interview was married/living with the partner, single, divorced or widowed. **Occupation**: refers to the work the respondent reported to be doing for living at the time of the study. **Religion**: refers to the religion of the respondent as mentioned during the interview. **Ethnicity**: refers to the ethnic group the respondent belongs as reported during the interview.
Hygiene Practices	
Source of water at the point of cooking: refers to where respondents fetch water at the point of cooking, whether direct from pipe, reservoir, and jerry can or from bucket. **Changing water for cleaning utensils**: refers to the frequency to which water used in washing utensils was changed. **Material for serving food**: refers to the kind of materials vendors used in serving food to clients, whether in recycled paper, plastic bags, leaves and plate or any take away material. **How food was fetched to serve**: refers to the manner in which respondents served food, either with the use of fork/spoon, bare hands or hand covered with rubber. **Handling money when handling food**: refers to whether respondents collect or give money to patrons using bare hands while alsoo handling food. **Hand washing**: refers to the frequency, times necessary and mode of hand washing of respondents. Veronica bucket provided: refers to whether veronica buckets were available at vending site. **Vendor wearing face mask**: refers to whether or not vendor was wearing face mask during sales to prevent covid-19. **Use of apron**: refers to whether the vendor was oobserved to be using apron during sales. **Hair covering**: refers to whether or not the vendor at the time of the interview was oobserved to have hair covered. **Cleanliness of finger nails**: refers to the extent to which finger nails were kept cleaned at the time of the interview. **Vegetable management**: refers to how vegetables were managed by street food vendors to ensure safety.	
Food Safety Standard Practices	**Professional Training of Street Food Vendors**
Food safety training: refers to whether any institution has oorganized food safety training for street food vendors at the time of the study. **Periodic medical examination**: refers to whether respondents have been	**Professional training**: refers to the professional

having medical examinations or not, and the frequency to which they underwent medical examination. **Medical examination**: refers to whether respondents had medical certificates to show. **License to operate**: refers to whether the respondents had oobtained license to operate as food vendor at the time of the study. **Regulatory officer visits**: refers to whether officers responsible for monitoring and evaluating their activities have been visiting or not.	status of food handlers at the time of this study, whether she/he has had some form of training in the food service trade or not.

Data Collection Tool

The main data collection tool employed in the study was a questionnaire and an observational checklist.

Questionnaire

The questionnaire was used to capture information on demographic characteristics, sanitation and hygiene practices of street food vendors, water supply and source, utensil cleaning, food serving and handling practices. The instrument was developed out of existing literature. It contained 5 sections numbered A to E. Section A gathered data on the socio-demographic characteristics of the participants, B gathered data on sanitary practices of food vendors and C on hygiene practices on food vendors. Section D solicited information on the level of adherence to safety standards and finally, E on association between level of education and safety practice. In all, the instrument contains 41 items. This was administered by research assistants who were be trained and deployed to visit vendors at their various sites of operation.

Observational checklist

The observational checklist was used to determine sanitary conditions of the immediate surrounding of the food vending site. This was deemed ideal for such variables that did not need interviews to solicit responses as they could visibly be observed at sight. This checklist was not used in isolation, but was an attachment to the main questionnaire.

Data Analysis

The data from the study were processed and analyzed using the Statistical Package for Social Sciences (SPSS, Version 21.0) (IBM Corp. Released, 2012).The SPSS software version 21 was used for data entry. Data was clean using frequencies were used for checking missing data, histogram for checking abnormality of the data and the data was homogeneous. Data analyses tools such as descriptive statistics and inference statistics were used for data analysis. Specifically, frequencies, percentages and chi-square were used. The univariate analysis involved the use of descriptive statistics such as frequencies and percentages to analyze figures on socio-demographic characteristics, sanitary and hygiene practices and food safety standards. Bivariate analysis was done using Chi-square test of independence (X^2) to ascertain the relationship variables of sanitary and hygiene practices and safety standards versus level of education. Test results were deemed statistically significant with reference to p-value less than 0.05. Results were presented in both tables and charts. Data was presented in tables and charts.

Limitation of the Study

Cross-sectional study designs usually are known for limitation in establishing causal relationships, as such the study was limited in establishing causal relations between

respondents' level of education and professional training, on best sanitary and hygiene practices and adherence to food safety standards. The use of participant responses as a measure to evaluate the influence of level of education and professional training on adherence to best sanitary/hygiene practices and safety standards may not be wholly representative of the status quo. For fear of recall bias, the real drive of the study was reiterated in order that respondents give precise feedback.

Ethical Consideration

Ethical clearance was first sought from the Ghana Health Service (GHS) Ethical Review Committee in order to obtain the full permission from the Department of Public Health, Catholic University College of Ghana. Proper community entry and institutional entry protocols were duly observed in order to obtain the permission of key stakeholders in the municipality before commencement of the data collection process.

At the level of the street food vendors, their consent was first sought before proceed conduct the interviews. By this, they were assured of confidentiality of the information given, and that the survey was purely academic and not out to incriminate anybody. Provision was made to them for voluntary withdrawal of participants from their involvement in the study at any point they felt unwilling to proceed.

CHAPTER FOUR: RESULTS

This section presented the results of the study. The results were presented according to the specific oobjectives of the study as well as the socio-demographic characteristics of the participants.

Socio-Demographic Characteristics of Respondents

The socio-demographic background information of the food sellers is presented in Table 1. The table showed that majority (94.1%) of the 270 street food vendors interviewed were females, with only few being males. The minimum age of the respondents stood at 17 years while the maximum age was 66 years. Also, majority (27%) of respondents were within the 26-34 age category, while less than 10% of respondents were spread within the ages of 55 to 66 years (Table 1). The study revealed that 101(37.4%), making majority of the 270 respondents had attained SHS/Vocational/Technical education, with oonly 1.9% said to have attained tertiary education. A good number (32.6%) of the street food vendors interviewed reported to have had no formal education. On the main ooccupation of respondents, majority (48.8%) were intoo unskilled manual ooccupations, with 118(43.7%) said to be intoo catering services as their main means of livelihood. Close to 80% of the 270 street food vendors interviewed were married, while an equal number of 11(4.1%) of respondents were respectively said to be divorced and widowed, and 12.6% reported as being single. On ethnicity, the large majority of 43.3% were found to be Dogomba, as the next dominant ethnic group among the respondents was Gurushi with approximately 18%. The religion widely practiced among respondents was Islam with 75.6%said to be in practice. African Traditional Religion (ATR) had less than 1% of respondents reported to be practicing (Table 1).

Table 1: Distribution of socio-demographic characteristics

Variable	Frequency (n=270)	Percentage (%)
Sex		
Male	16	5.9
Female	254	94.1
Age group (years)		
17-25	64	23.7
26-34	73	27.0
35-44	63	23.3
45-54	48	17.8
55-66	22	8.2
Education		
No formal education	88	32.6
Basic Education	76	28.1
SHS/Voc/Tec	101	37.4
Tertiary	5	1.9
Main Occupation		
Farming	5	1.9
Professional	10	3.7
Catering services	118	43.7
Skilled manual	5	1.9
Unskilled manual	132	48.8
Marital status		
Single	34	12.6
Married	214	79.2
Divorced	11	4.1
Widowed	11	4.1
Ethnicity		
Dagomba	117	43.3
Gonja	45	16.7
Gurushi	49	18.1
Moshi	34	12.6
Others	25	9.3
Religion		
ATR	2	0.7
Christianity	64	23.7
Islam	204	75.6

Source: Field Survey

On the number years the respondents have been in the street food vending business, majority (39.6%) of the 270 respondents were involved in the business for 2-3 years, while 50(18.5%) were reported to be in the first year of the business. Of those who were said to have been operating in the business for at least 5 years stood at 62(23%), as displayed below (Figure 2).

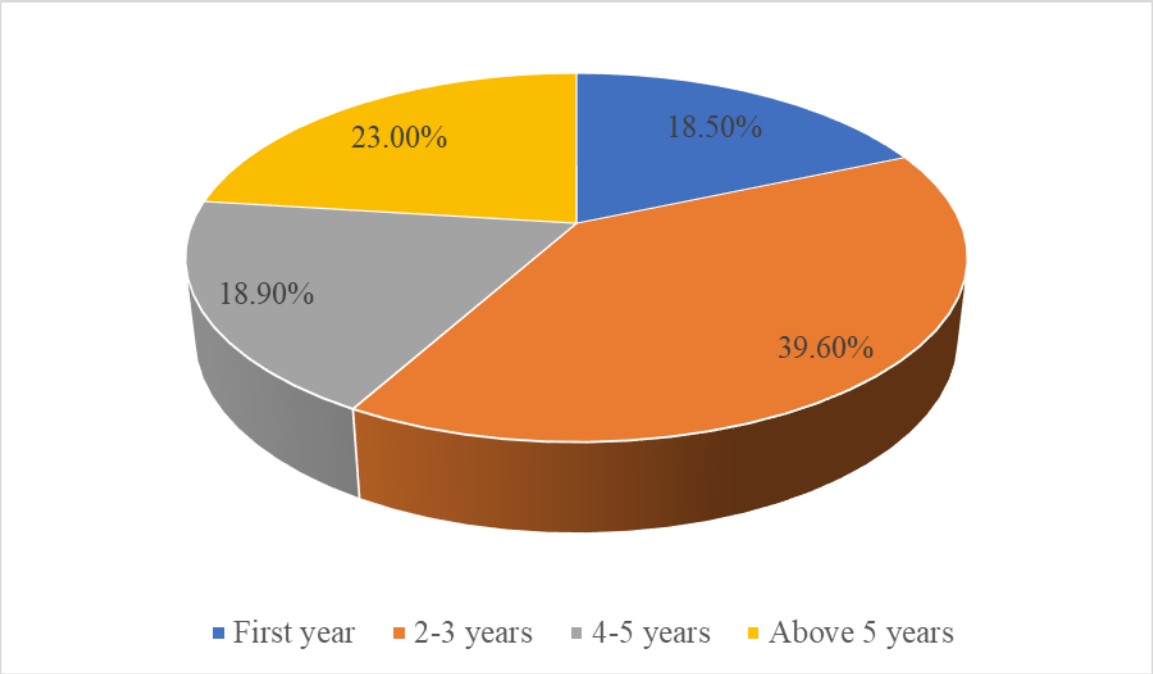

Figure 2: Number of years of respondents in street vending business

Sanitary Practices of Respondents at the Vending Site

The purpose of this objective was to assess the sanitary practices of food vendors in order to measure its health implications of the population. The study employed frequencies and percentages to assess these practices. Table 2 below found that majority (81.9%) of respondents have their vending site located near the road. The study alsoo found 211(78.1%) to be using structures such as kiosks and metal containers, with the few (21.9%) ooperating in the open, mostly using tables. On the proximity of the vending site to a gutter, majority (66.3%) were close to gutters. Also, majority (58.1%) of respondents had their spots estimated to be 2 steps (1.52m) away from the gutter, while 32(17.9%) were 1 step (0.75m) away from the gutter. The study also looked at the nature of the gutters said to be in sight around the vending site, revealing that a little over 60% of respondents had open gutters around them. In assessing the cleanliness of the immediate surroundings, 154(57%) of respondents had the vending area being cleaned enough, with as much as 43% found to have filthy surroundings. With the availability of waste bins at vending site, majority (55.6%) were without waste bins at the vending site (Table 2).

Table 2: Environment of vending sight

Variable	Frequency (n=270)	Percentage (%)
Location of vending site		
Road side	221	81.9
Away from road	49	18.1
Food sold in designated structures		
Yes	211	78.1
No	59	21.9
Gutter close to vending site		
Yes	179	66.3

No	91	33.7
How close it is to vending site		
1-step (0.76m)	32	17.9
2 steps (1.52m)	104	58.1
3-steps (2.29m)	38	21.2
4-steps or more	5	2.8
Nature of gutter		
Open gutter	109	60.9
Closed gutter	70	39.1
Vending site clean enough		
Yes	154	57.0
No	116	43.0
Availability of waste bins		
Yes	120	44.4
No	150	55.6

Source: Field Survey

As shown in Figure 3 below, it was revealed that majority (45.6%) of the food vendors said they dumped their refuse in a community refuse container. This was followed by a 75 (27.8%) of respondent who indicated they dumped their refuse in a community dumping site in the open, and as much as 23.7% also dumped their refuse indiscriminately, either in gutters, drains and any next available space.

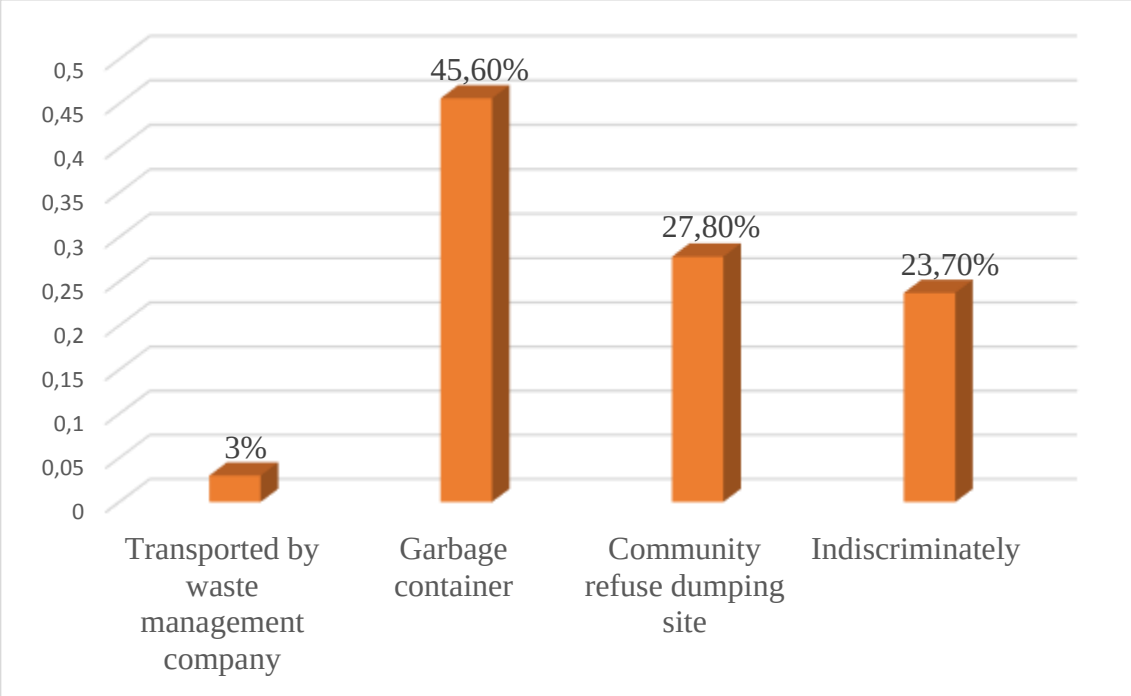

Figure 3: Refuse dump site of respondents

Hygiene Practices of Respondents

The main aim of this section was to assess the hygiene practices among food vendors in order to determine the environmental circumstances for the practice. Frequencies and percentages were the tools used to arrive at the state food hygiene practices among the food hawkers. Figure 4 showed that majority (61.1%) of the respondents noted the water used for cooking was stored in jerry cans, while 56 (20.7%) fetch the water for cooking from reservoirs. Those who reported to fetching water directly from the pipe stood at 41 (15.2%).

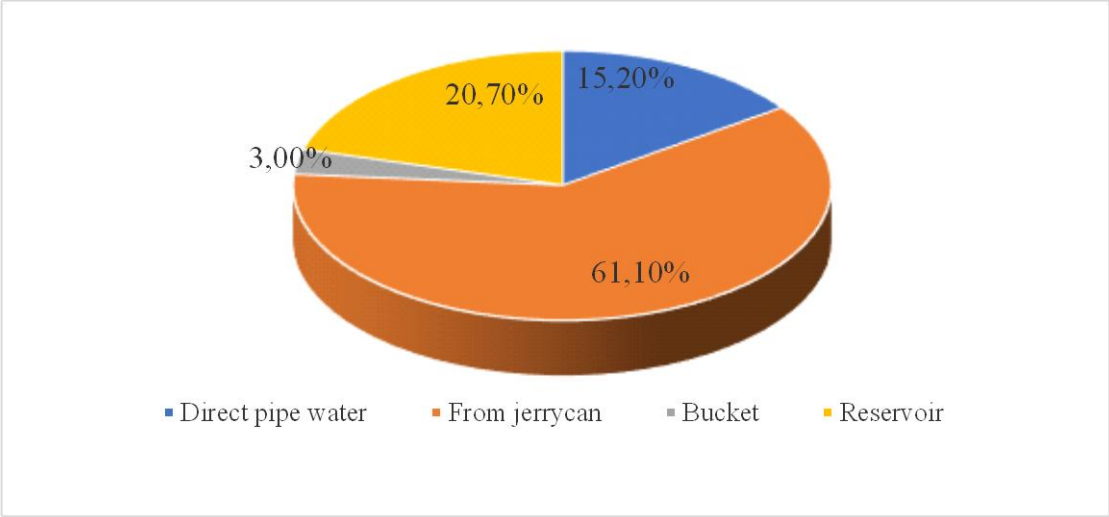

Figure 4: Where respondents fetch water from at the point of cooking

The study assessed the various hygiene parameter in relation to the operation of the street food vendors, as shown in Table 3. Most respondents (81.9%) only changed the water when it was deemed dirty per their judgment, with only 7 (2.6%) usually change the water after each round of washing. The study found that, food was mostly served in plates or any take away material with 179 (66.3%) attesting. The use of plastic bags was the next popular material used or means of serving food to clients as 83 (30.7%) reported to issue food to clients in plastic bags (see Table 3A). Also, more (70%) of the respondents noted they used ladles/forks when dishing out food to customers. Interestingly, about 4.1% were said to use bared hands to serve food to customers. On the handling of money versus food, close to 100% of the respondents noted they handle money with bare hands used to handle food. The frequency to which food vendors washed hands was said to be done sparingly by majority (59.6%) of respondents, while 97 (35.9%) said hand washing was a habitual practice (see Table 3A).

Table 3A: Hygiene practices of respondents

Variable	Frequency (n=270)	Percentage (%)
Changing water for cleaning utensils		
After every washing	7	2.6
After twoo times of washing	42	15.6
When dirty	221	81.8
Material for serving food to clients		
Recycled paper	5	1.9
Plastic bags	83	30.7

Leaves	3	1.1
Plate or any take away material	179	66.3
How food is fetched to serve		
With fork/spoon	189	70.0
With bare hands	39	14.4
Hand covered with rubber	42	15.6
Handling money with bare hands when handling food		
Yes	267	98.9
No	3	1.1
Hand washing frequency		
Habitual	97	35.9
Sparingly	161	59.6
Can't tell	12	4.5

Source: Field Survey

In an assessment of the times deemed to be necessary for hand washing by the street food vendors, majority (93%) opted for the instance where one returns from toilet/urinal as shown in Figure 5A. Washing of hands after touching money was not regarded as a necessity by a little over 94% of the street food vendors interviewed. Again, closed to 82% of the study participants felt washing of hands in each interval food was to be served should not be a necessity.

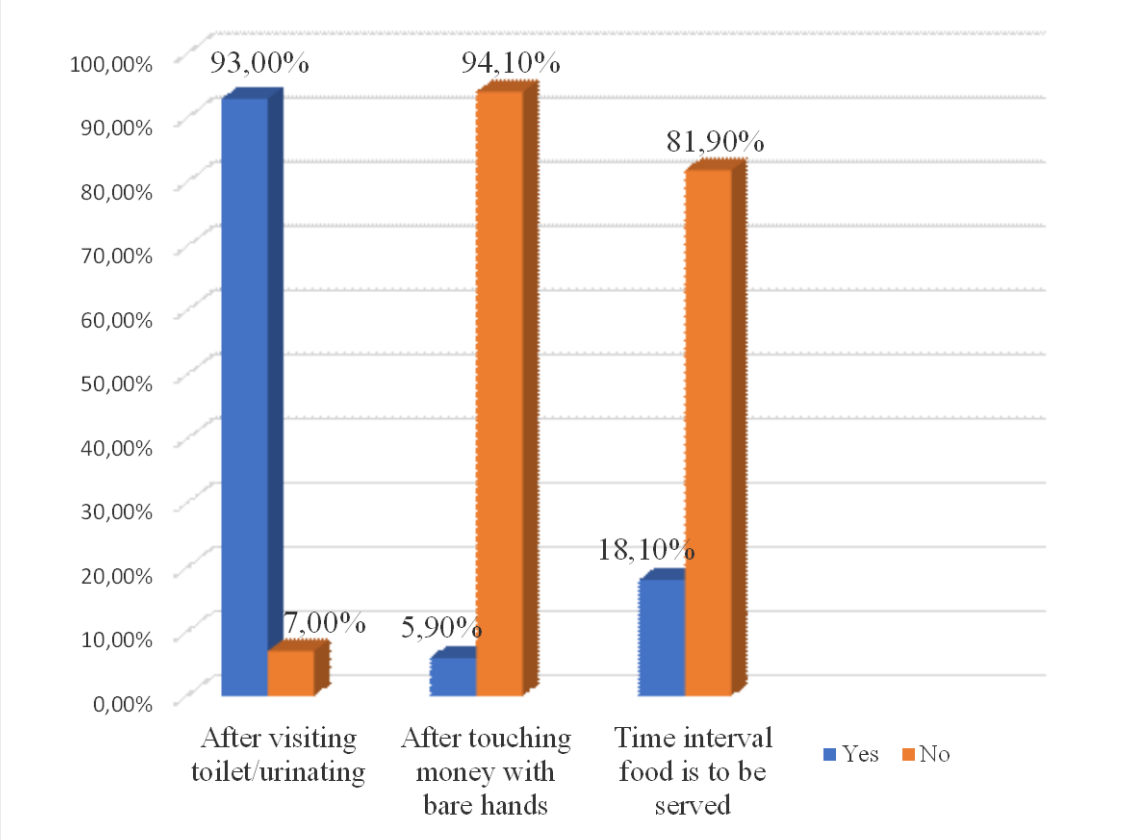

Figure 5A: Times of necessity for hand washing

The study found that washing hands with soap under running water was the mode adopted by most (88.1%) of the street food vendors. Alsoo, 27 (10%) of respondents noted they washed their hands with soap but using a washing container, while less than 2% of the respondents were said to washed hands anyhow, either with the use of soap or without soap (see Figure 5B).

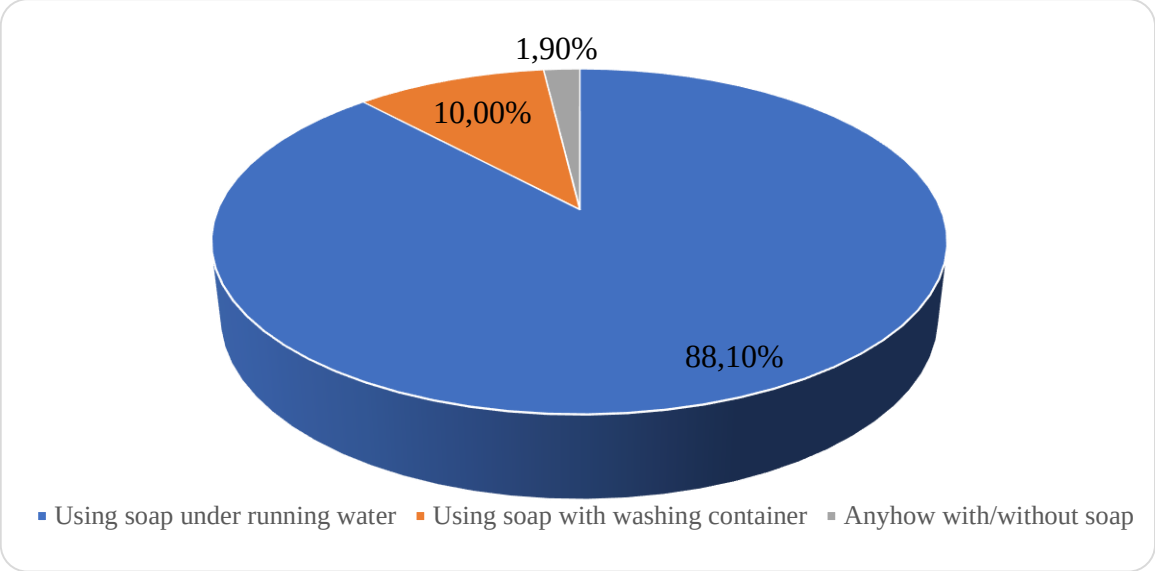

Figure 5B: Respondent's mode of hand washing

The use of Veronica buckets at the vending site as a measure to prevent the spread of covid-19 was also assessed. It was revealed that majority (67.8%) of the street food vendors were not having veronica buckets at the vending sites. On the wearing of face mask, a little above 95% were seen wearing face masks as a measure to prevent the spread of covid-19. Further, as much as 90% of respondents were observed not to be wearing apron, with 56.3% observed to have their hair covered. Majority (54.1%) had their finger nails cleaned. On whether vegetables were part of their ingredient list, 57% said they do not use vegetables as the kind of food they prepare does not require that. Of those who said they used vegetables, a little over 95% noted the vegetables were always thoroughly washed before use (Table 3B).

Table 3B: Hygiene practices of respondents

Variable	Frequency (n=270)	Percentage (%)
Veronica bucket provided at vending site for hand washing		
Yes	87	32.2
No	183	67.8
Vendor wearing face mask to prevent covid-19 spread		
Yes	13	4.8
No	257	95.2
Does vendor use apron		
Yes	27	10.0
No	243	90.0
Does vendor cover the hair		
Yes	152	56.3

No	118	43.7
Vendor wearing face mask to prevent covid-19 spread		
Yes	13	4.8
No	257	95.2
Finger nails kept clean		
Yes	146	54.1
No	124	45.9
Vegetables part of ingredient list		
Yes	116	43.0
No	154	57.0
How the vegetables are managed to ensure safety		
Mostly rinse in water	5	4.3
Thoroughly washed	111	95.7

Source: Field Survey

Level of Adherence to Safety Standards by Respondents

The level of adherence to food safety standards among street food vendors was assessed using frequencies and percentages. The least (34.8%) of the street food vendors had some professional training on their operations as food service providers. On whether they had training intermittently in the course of their operations on food safety, closed to 100% of the participants have never had any form of training on food safety in they have been in the business. Having a medical certificate is one key requirement to gain authorization to commence a food service business. The study found that closed to 76% of respondents noted they have not had any medical examination since they started the food vending business. Of the 65 (24.1%) participants who said they have been having periodic medical examinations, 35(49.2%) noted the frequency to which medical examinations were conducted in the past one and half year, while 24 (36.9%) reported to only see the need for medical examination when prompted by a regulatory oofficer. Also, only 46 (17%) were having a medical certificate to show, though 65 (24.1%) were earlier reported to have undergone medical examination. On the possession of a licensed certificate to operate of as food vendors, closed to 80% of the respondents reported that they have not been licensed to operate as food vendors, and had no certificate to show as authorization to commence operation. (see Table 4).

Table 4: Respondents' level of adherence to safety standards

Variable	Frequency (n=270)	Percentage (%)
Professional training in food vending		
Yes	94	34.8
No	176	65.2
Food safety training oorganized by any institution		
Yes	2	0.7
No	268	99.3
Having medical examinations periodically		
Yes	65	24.1
No	205	75.9

Frequency of medical examination		
Every half year	32	49.2
Unless prompted by regulatory officers	24	36.9
Other	9	13.8
Medical Certificate to show		
Yes	46	17.0
No	224	83.0
Licensed to operate as a food vendor		
Yes	55	20.4
No	215	79.6
Regulatory officers'' visits for inspection		
Yes	94	34.8
No	176	65.2
Particular regulatory oofficers		
FDA	49	52.1
Environmental health	45	47.9
Food safety manual available to guide operations		
Yes	4	1.5
No	266	98.5

Source: Field Survey

Association between Level of Education and Various Food Safety Parameters

This objective had the aim of determining the association between level of education and the various food safety parameters using Chi square test statistics. The parameters were sanitary/hygiene practices and adherence to safety standards.

Association between level of education and sanitary/hygiene practices

A chi-square test of independence was performed to assess the association between level of education of the street food vendor and location of the vending site. The relationship between these two variables was significant, X^2 (3, N = 270) = 7.382, p = 0.049. This implies that participants who had some form of formal education were more likely to have their vending site located away from the road. The association between level of education of the street food vendor and the availability of waste bin(s) at vending site was also found to be significant, X^2 (3, N = 270) = 8.051, p = 0.039. This goes to suggest that, the higher the level of education of the respondents the more likely he/she would have a waste bin at the vending site and vice versa. Further, the vendor's level of education and frequency to which water used for washing utensils was changed showed a significant relationship with the level of education of respondents, X^2 (3, N = 270) = 19.459, p = 0.002. The vendor could be in a better position to frequently change the water used for washing utensils if she/he had attained formal education to a higher level.

The level of education of the street food vendors interviewed and their handling of money with bare hands when handling food also showed a significant relationship X^2 (3, N = 270) = 7.459, p = 0.041. This implies that respondents who attained higher education were less likely to touch money with bare hands while handling food. The study further revealed a significant association [X^2 (3, N = 270) = 11.241, p = 0.008] to exist between the level of education of the

street food vendor and the provision of veronica bucket at the vending site for hand washing. This is to say that, vendors whoo attained higher education were more likely to have veronica buckets at the vending site for hand washing than those who reported to have attained no formal education. The study however did not find the relationship between level of education of the street food vendors interviewed and the level of cleanliness of the vending site, frequency to which they washed hands, Vendor's wearing of apron, vendor's wearing of hair-cover and whether vendor keeps clean finger nails respectively, as shown below (Table 5).

Table 5: Association between educational and sanitary/hygiene practices of respondents

Variables	Educational level				Chi-sq. Fisher Exact (X^2)	df	p-value
	None	Basic	SHS/ Voc/ Tech	Tertiary			
Location of vending site							
Road side	64(29)	67(30.3)	85(38.5)	5(2.3)	7.382	3	0.049
Away from road	24 (49)	9(18.4)	16(32.7)	0(0)			
Vending site clean enough							
Yes	46(29.9)	41(26.6)	62(40.3)	5(3.2)	5.479	3	0.132
No	42(36.2)	35(30.2)	39(33.6)	0(0)			
Availability of waste bin(s) at vending site							
Yes	40(33.3)	28(23.3)	47(39.2)	5(4.2)	8.051	3	0.039
No	48(32.0)	48(32.0)	54(36.0)	0(0)			
How often water for cleaning utensils is changed							
After every washing	1(14.3)	1(14.3)	29(28.6)	3(42.9)	19.459	6	0.002
After two times of washing	13(31.0)	13(31.0)	15(35.7)	1(2.4)			
When dirty	74(33.5)	62(28.1)	84(38.0)	1(0.5)			
Handling money with bare hands when handling food							
Yes	88(33.0)	75(28.1)	100(37.5)	4(1.5)	7.459	3	0.041
No	0(0)	1(33.3)	1(33.3)	1(33.3)			
How ooften do you wash hands							
Habitual	25(25.8)	28(28.9)	40(41.2)	4(4.1)	6.928	6	0.304
Sparingly	59(36.6)	44(27.3)	57(35.4)	1(0.6)			
Can't tell	4(33.3)	4(33.3)	4(33.3)	0(0)			
Veronica bucket provided at vending site for hand washing							
Yes	24(27.6)	22(25.3)	36(41.4)	5(5.7)	11.241	3	0.008
No	64(35.0)	54(29.5)	65(35.5)	0(0)			
Does vendor use apron							
Yes	4(14.8)	9(33.3)	13(48.1)	1(3.7)	5.602	3	0.116
No	84(34.6)	67(27.6)	88(36.2)	4(1.6)			
Does vendor cover hair							
Yes	46(30.3)	47(30.9)	56(36.8)	3(2.0)	1.667	3	0.647
No	42(35.6)	29(24.6)	45(38.1)	2(1.7			
Does vendor keep clean finger nails							
Yes	42(28.8)	40(27.4)	61(41.8)	3(2.1)	3.255	3	0.348
No	46(37.1)	36(29.0)	40(32.3)	2(1.6)			

Association between level of education and adherence to safety standards

The relationship between level of education and the street food vendors' adherence to

safety standards are shown below (see Table 6). A statistically significant association, X^2 (3, N = 270) = 8.968, p = 0.025 was found to exist in a chi-square test of independence between level of education of the street food vendors interviewed and professional training in food vending. This goes to say that street food vendors who had attained some level of formal education were more likely to undertake professional training in food vending compared with those who had no formal education. Also, the level of education and licensed to operate as food vendor showed a significant association, X^2 (3, N = 270) = 8.189, p = 0.036. This implies that respondents with higher education were more likely to have oobtained license to ooperate as food vendor than those who had no formal education.

However, no statistically significant relationship was shown to exist between the level of education of the food vendors interviewed and having periodic medical examinations, and medical certificate available to show.

Table 6: Association between level of education and adherence to safety standards

Variables	Educational level				Chi-sq Fisher Exact (X^2)	df	p-value
	None	Basic	SHS/ Voc/ Tech	Tertiary			
Professional training in food vending							
Yes	22(23.4)	29(30.9)	39(41.5)	4(4.3)	8.968	3	0.025
No	66(37.5)	47(26.7)	62(35.2)	1(0.6)			
Periodic medical examinations							
Yes	16(24.6)	20(30.8)	26(40.0)	3(4.6)	5.351	3	0.130
No	72(35.1)	56(27.3)	75(36.6)	2(1)			
Having a medical certificate to show							
Yes	11(23.9)	14(30.4)	18(39.1)	3(6.5)	6.675	3	0.070
No	77(34.4)	62(27.7)	83(37.1)	2(0.9)			
Licensed to ooperate as a food vendor							
Yes	13(23.6)	23(41.8)	17(30.9)	2(3.6)	8.189	3	0.036
No	75(34.9)	53(24.7)	84(39.1)	3(1.4)			

CHAPTER FIVE: DISCUSSION

The chapter discussed the results of the study in relation to existing evidenced. The discussion was done based on the specific oobjectives of the study.

Sanitary Practices

The sanitary practices investigated in this study include the location of vending of vending site, designated structures in which food was sold, closeness of vending site to a gutter, the extent of closeness to the gutter, nature of gutter, cleanliness of vending site, and availability of waste bins at site. The study found majority of the street food vendors spotted by the road side. Likewise, majority were found to have the food sold in designated structures. This goes to buttress the Food and Agriculture Organization's findings in Accra that street food vendors were located closed to the road, with one half of the outlets said to be located near roads where car traffic was normal, and one fifth of the street food vendors was found in streets with almost no traffic; one third operated in heavily trafficked areas, where pollution becomes a crucial risk for food safety (FAO, 2016). It was observed that closed to 80% of respondents were operating their food vending business on designated structures such as stalls, table kiosks

and metal containers, while only a few were seen operating in the open, mostly using tables. This appears to be in consonance with the FAO (2016), most food sellers interviewed along the streets of Accra operate from a stall or table, with many oothers said to be having a fixed kiosk, and further intimates that three fourths of the ooutlets were oobserved to have been built with wood.

This study assessed the proximity of the vending site to gutters, and oobserved that majority (66.3%) were operating closed to gutters, the specific distance of 2 steps (1.52m) to the gutter having majority (58.1%) of respondents. The study also found that a little over 60% of respondents were operating around open gutters. This goes to buttress Ntow *et al*. (2016) report in Hohoe, disclosing that the greater percentage (86.89%) of street food vendors in Hohoe sold food very close to an open gutter of which only 27.36% paid attention to the cleanliness of the gutter (Ntow *et al*., 2016).

This study on cleanliness of the immediate surroundings of street food vending sites observed that, the slight majority of respondents had the vending area being cleaned enough, with as much as 43% found to have filthy surroundings. In line with this, several studies disclosed that majority of street food vendors had their vending sites cleaned enough (Tesfaye & Tegene, 2020; Okojie & Isah, 2014b). In contrast, a number of oother studies revealed of filthy surroundings being operated upon by street food vendors (Lues *et al*., 2006); (Marutha & Chelule, 2020). On the availability of waste bins at vending site, this study found majority of respondents without waste bins at vending site. This goes to affirm Okojie & Isah (2014) report in Nigeria, where only 43.4% of street food vendors interviewed were said to have waste bins on vending site.

Hygiene Practices of Respondents

The study assesses the performance of the selected street food vendors on various hygiene parameters such as; frequency of changing water used to clean utensils, materials used for serving food, how food was fetched during servings, handling money with bare hands when handling food and hand washing frequency. The study discovered majority of respondents agreeing to the fact that they only change the water when it was deemed dirty per their judgment, as less than 4% noted they changed the water after each round of washing. This appears in line with this Marutha & Chelule (2020), who brought to the fore that less than half of the street food vendors interviewed in Polokwane Central Business District were oobserved to have cleaned their utensils adequately after every use with soapy water. To wash adequately highlights that all conditions surrounding including the frequency was change after each round of washing were met. On materials used to serve clients, this study found that majority (66.3%) of food vendors were said to mostly serve food in plates or any take away material with less than 31% of respondents serving food in plastic bags. Conversely, the Odonkor *et al.* study in Accra found majority (40%) serving food in polyethene bags, and 36% reported to serve food in plates or bowls (Odonkor *et al.*, 2011).

This study observed that the food vendors oobserved to be dishing food with ladles/forks form the greater majority, with just a few (less than 5%) observed to be using bared hands to serve food to customers. This goes to buttress the findings of a number of studies, which opined that the vast majority of street food vendors interviewed handed food with bare hands (Chukuezi, 2010; Hassan *et al.*, 2017; Monney *et al.*, 2014; Marutha & Chelule, 2020). Money

which revolves without limits is reported by microbiologist to be one sure medium of spread of diseases. In view of this, this study sought to know the street food vendors' practice of money handling versus food handling, and found that closed to 100% of respondents noted the handle money with bare hands when handling food. The findings of this current study is in consonance with the Cortese *et al*. (2016) findings in Brazil, in which 95% of street food handlers were found handle money with bare hands while serving food. Similarly, was reported in the Techiman Municipality in Ghana that only a few (22%) of food vendors washed their hands after handling money before proceeding to handle food.

Hand washing, which is regarded as a key measure in preventing the transfer of germs and infections was assessed. The study found that closed to 60% of respondents could not confirm the frequency to which the practiced hand washing as it was said to be done sparingly, while a few noted that hand washing was part of their lifestyle, intimating their frequency of hand washing could be described as habitual. The finding of this current study appears in contrast with that of Dun-dry and Addo (2016) findings in Wa, where it was brought to the fore that majority (44%) of food vendors interviewed washed hands every 20-30 minutes, and 42% said to wash hands before each serving (Dun-dery & Addo, 2016).

Adherence to Safety Standards

The level of adherence to food safety standards by the street food vendors was assessed with focus on professional training in food vending, food safety, medical examination and its frequency, license to operate, regulatory officers' visit and the availability of food safety manual, and the focus of this study appears to fall in agreement to the World Health Organization (WHO) five keys to safer foods (Mwamakamba *et al.*, 2012). Though the importance of prior training on food handling cannot be oover emphasized (Marutha & Chelule, 2020; Okojie & Isah, 2014), this current study revealed that less than 35% of the street food vendors interviewed reported to have undergone some professional training on their operations as food service providers, with the vast majority ooperating without any form of training on the trade. This is in tune with the findings in Nigeria which indicated that about 61.9% of the street food vendors interviewed did not have any formal training on food handling (Aluko *et al.*, 2014).

Conducting a medical examination with a certificate to show is a prerequisite for commencement of business as a food vendor as envisioned by Ghana Standards Authority, unfortunately this study finds that the larger majority of the street food vendors interviewed indicated they had no medical examination since they started the food vending business. In contrast to this current study, closed to 80% of food vendors interviewed in a study in Hohoe were reported to have undergone medical screening, and that 44.30% of this number had evidence of the screening done (Ntow *et al*., 2016). On the evidence of medical examination in this study, 17% were having a medical certificate to show, though this again is in contrast to the Ntow *et al*. findings in Hohoe, it is in consonance with the report in another study where seventy-three percent of the street food vendors were said not to have obtained a food handlers' medical certificate (Johnson *et al*., 2020). This study found that oover 75% of respondents indicated they have not been having periodic medical examinations.

On the visit of regulatory officers such as the FDA, Environmental Health Department, Tourism Authority and so on, this study found that less than 35% of respondents said regulatory

oofficers have been visiting them for inspections to ensure they abided by the lay down safety standards, with all mentioning the Environmental Health Department.

Association between Level of Education and Various Food Safety Parameters

Association between level of education and sanitary/hygiene practices

The chi-square test of independence performed in this study, to assess the association between level of education of the street food vendor and the various sanitary/hygiene practices revealed location of the vending site, availability of waste bins, frequency of changed water for cleaning utensils, handling of money with bare hands when handling food and having a veronica at vending site to have a significant association with level of education of the street food vendor. For instance, the chi-square test of independence showed a statistically significant relationship ($p = 0.049$) to exist between level of education of the street food vendor and location of the vending site. Conversely, Nurudeen, *et al*. (2014), opined that the association between venders' level of education and vending location was not found to be significant ($p > 0.05$). The chi-square test of association showed a significant association ($p = 0.039$) to exist between level of education of the street food vendor and the availability of waste bin(s) at vending site. This appears to be in tune with Ahmad *et al*. report where the intimated a strong association to exist between level of education and hygiene practices at vending site including the provision of waste bins to manage solid waste (Ahmad *et al.,* 2018).

A number of hygiene practices were found to show significant association with vendors' level of education. The association between vendor's level of education and the frequency to which water used for washing utensils was changed, handling of money with bare hands when handling and the provision of veronica bucket at the vending site for hand washing were statistically significant ($p = 0.002$) and $p = 0.041$ respectively. In line with the current study, it was revealed in Bangladesh that only the level of education showed significant influence ($p = 0.015$) on the food safety practices of the vendors (Hossen *et al.,* 2020).

Association between level of education and adherence to safety standards

The relationship between level of education and the street food vendors' adherence to safety standards was assessed using chi-square test of independence. The study found a strong association to exist between level of respondents' education and professional training, and license to operate as food vendors. Buttressing this, Rahman *et al*., opined that level of education was suggested to have some significance on professional training and on other food handling practices of street food vendors (Rahman *et al*., 2012). This study also brought to the fore, that the level of education of the street food vendors interviewed and professional training in food vending showed a statistically significant association ($p = 0.025$). This finding could not be supported by Addo-Tham *et al*. who revealed that level of education of respondents did not show any statistical relationship with license to operate (Addo-Tham *et al*., 2020).

No statistically significant relationship was found to exist between the level of education of the food vendors interviewed and having periodic medical examinations, and medical certificate available to show.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

The chapter drew conclusion from the study and made recommendations based on the main findings of the study.

Conclusion

In conclusion, the study found the performance of street food vendors in the Sagnarigu Municipality on various food safety practices to be poor, and level of education of the street food vendor showed significant relationship with a number of the food safety parameters assessed. The relationship between level of respondent's education and location of vending site, waste bin availability at site, frequency to which water used to wash utensils was changed, handling money with bare hands when handling food, provision of veronica bucket at vending site, professional training and licensed to operate as food vendor, to be statistically significant.

Recommendations

Based on the findings of this study, the following recommendations were made for appropriate stakeholder consideration:

- People whoo venture into food service business may have to be encouraged to pursue some level of professional training on food handling.
- Regulatory Officers may have to step-up enforcement of medical examination and certification as a primary standard that must be complied in order to operate as a food vendor.
- Environmental Health Officers may have to consider conducting regular visits to street food vending sites to ensure that high food safety standards were upheld.
- Urban roads department may consider closing or repairing dilapidated gutters.
- The general public could be educated on food safety standards, and be advised to play watch dog roles on food vendors to ensure they upheld high safety standards at all times.
- More educated persons may venture into food vending as a means of livelihood and also help raise the standards.

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Appendix I: Clearance Letter from GHS Ethics Committee

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Digital Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Email: ethics.research@ghsmail.org

*MyRef. GHS/RDD/ERC/Admin/App*120/421
Your Ref. No.

19th October, 2020

Abu Issahaku
Northern Regional Health Directorate
P.O. Box 99
Tamale

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC 055/08/20**
Study Title	Hygienic and Sanitary Practices of Street Food Vendors in the Sagnarigu Municipality of Northern Region, Ghana
Approval Date	19th October, 2020
Expiry Date	18th October, 2021
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. James Akazili
(Head, Ethics & Research Management Department)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra

Appendix II: Map of Sagnarigu Municipality