SCHOOL OF PUBLIC HEALTH

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HYGIENE PRACTICES AMONG UNCOOKED VEGETABLE AND FRUIT SELLERS AT ASHAIMAN CENTRAL MARKET IN THE ASHAIMAN MUNICIPALITY, GHANA

BY

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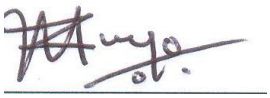
DECLARATION

I solemnly declare that apart from the references to other people's work which have been duly acknowledged, this dissertation is as a result of my own independent work done under the supervision of Dr Mawuli Dzodzomenyo. The findings incorporated in this dissertation have not been submitted to any institution for the award of any degree.

…….. 16th July, 2021 ……..

Angelina Paula Ayensu Date

(Student)



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Dr Mawuli Dzodzomenyo Date

(Supervisor)

DEDICATION

This project work is first and foremost dedicated to the Almighty God for making it possible for it to happen and for this dissertation to be presented. To my loving husband, special thanks for his wonderful support during the entire programme.

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Table of contents

LIST OF TABLES

LIST OF FIGURES

DEFINITION OF TERMS

1. Food Vendor – A food vendor is one who sells cooked food. However, a food vendor could also be a food handler or vice-versa.

2. Food Handler – A food handler is a person who works with packaged or unpackaged food, food equipment or utensil, or food- contact surfaces for a food service establishment.

3. Hygienic Practices –A set of practices performed for the preservation of health.

4. Street Vended foods –Foods and beverages prepared and/or sold by vendors on streets and other public places for immediate consumption or consumption later without further processing or preparation.

5. Food Hygiene – practices that prevent microbial contamination of food at all points along the chain from farm to table.

6. Food Safety – A scientific discipline describing handling, preparation, and storage of foods in ways that prevent foodborne illness.

7. Food – borne disease –Is an infection or irritation of the gastrointestinal tract caused by food or beverages that contain harmful bacteria, parasites, viruses, or chemicals.

8. Personal Hygiene –Involves those practices performed by an individual to care for one's bodily health and well-being through cleanliness.

9. Environmental Hygiene –Measures undertaken to keep the human environment safe and healthy to live in, including waste disposal, clean water supplies, food safety controls and good housing.

10. Perishable food: food items that have a short storage life and will become spoiled or contaminated if not preserved and handled properly, e.g., meat, eggs, milk, fruits, vegetables, and the like.

11. **Non-perishable food**: foods which are not easily spoiled or contaminated, e.g., sugar and cereals.

12. Food hazard: food that is contaminated with biological, chemical, or physical agents and, if eaten, will cause ill health.

LIST OF ABBREVATIONS

CDC	-	Centers for Disease Control and Prevention
CPHP	-	Centre for Public Health Practice
EHP	-	Environmental Health Practitioner
FAO	-	Food and Agriculture Organization
FDA	-	Food and Drugs Authority
GH-ERC	-	Ghana Health Service Ethics Review Committee
GHS	-	Ghana Health Service
GSA	-	Ghana Standard Authority
HACCP	-	Hazard Analysis & Critical Control Point
HAM	-	Health Action Model
KAP	-	Knowledge, Attitude & Practices
MOH	-	Ministry of Health
NGO	-	Non-Governmental Organizations
SFVs	-	Street Food Vendors
SPSS	-	Statistical Package for Social Sciences
WHO	-	World Health Organization

ABSTRACT

Background: Food hygiene comprises the conditions and measures necessary to ensure the safety of food from production to consumption. It is difficult to find anyone who has not experienced an appalling moment of foodborne illness at least once in the past year. In developing countries, foodborne illness tends to increase due to the rise in the poor handling of uncooked foods like vegetables and fruits. Markets serve as main sources of food, and contamination may occur during the handling process impacting on food safety.

Objectives: The objective of the study was to assess the major hygiene practices and other related factors among uncooked vegetable and fruit sellers at Ashaiman Central Market.

Methods: The design was a descriptive cross-sectional study employing quantitative approach to data collection. A total of 370 uncooked vegetable and fruit sellers were interviewed from Ashaiman Central market during June 1st,2020 to June 30th,2020. Respondents were selected using simple random sampling technique. A structured questionnaire was used to collect quantitative data from the vegetable and fruit sellers. The assembled data were analyzed using Stata version 15 involving the use of frequency distribution tables, Chi-square test and logistic regression to show the association between the hygiene practices and independent variables. A significance level of 5% was used for the research.

Results: The findings of the study indicated that nearly sixty five percent of vegetable and fruit sellers practiced good hygiene (denoting very often and always), whereas about half (48.4%) had adequate knowledge (p=48.4%;95% CI=43.2%- 53.6%) of good hygiene practices. Respondents who sold fruits had significantly 53% reduction in their odds of practicing good hygiene as compared to those who sold vegetables. Being female (aOR = 24.31; 95% CI = 3.12 – 189.15; p = 0.002) , type of uncooked/raw foodstuff sold aOR = 0.47; 95% CI = 0.25 – 0.88; p = 0.018)., mode of preservation of fruits and vegetables(aOR = 0.28; 95% CI = 0.14 – 0.56; p < 0.001) and lack of constant water supply at selling point (aOR = 0.57; 95% CI = 0.34 – 0.95; p = 0.032) were significant predictors of good hygiene practices among the vendors.

Conclusion: Sixty five percent of vegetable and fruit sellers practiced good hygiene with nearly half of them having adequate knowledge of good hygiene practices. Gender, type of uncooked/raw foodstuff sold, mode of preservation of vegetables and fruits and water supply at selling points were factors associated with hygiene practices among the vegetable and fruit vendors.

Recommendations: The study found that vegetable and fruit sellers at the Ashaiman central market generally practiced good hygiene. That notwithstanding, vegetable and fruit handling practices by these market women prevail mostly unsafe presenting potential health problems. The Ashaiman Municipal Assembly must embark on effective routine food inspection, continuous supervision of the cleanliness of the market and sustained food hygiene education which are critical in promoting food hygiene.

CHAPTER ONE

INTRODUCTION

1.1 Background

The conditions and measures required for food safety from manufacturing to consumption are food hygiene. (WHO, 2006). According to World Health Organization (2006) major outbreaks of foodborne disease occur regularly on practically every continent and display that, unsafe food is a world-wide public health problem. Consequently, food is included under the revised International Health Regulations. (World Health Organization, 2006).

Diseases resulting from contaminated food and water are a major cause of morbidity and are still a common threat to public health. Human infections resulting from eating raw vegetables and fruits have increased to an alarming rate during the past decade.

In low and middle-income countries, foodborne illnesses tend to increase due to the surge witnessed in the consumption of risky foods, namely farm animals, fish products, and fresh produce. The continent of Africa and Southeast Asia have been deemed to have the highest rates of incidence and mortality associated with foodborne diseases. An estimated 91 million people fall ill and 137,000 people die yearly in the African region because of consumption of contaminated foods and water (WHO, 2015).

Studies done in Egypt, Libya, Saudi Arabia, Iraq, Iran, the Philippines, Arbaminch, and Ethiopia to evaluate the role uncooked vegetables and fruits play in the transmission of medically important parasites have emphasized that fruits and vegetables, mostly consumed raw and

unwashed, play a prominent part in the transmission of protozoans and helminths of clinical significance. (Bekele & Shumbej, 2019).

Like many other developing countries, Ghanaians suffer from poor sanitation and low-quality living conditions which make them vulnerable to parasitic infections.

A study conducted by(Abass, Foster, Owusu, & Gyasi, 2019) that examined hygiene practices and health risk perception of vegetable sellers using qualitative approach showed that vegetable handling practices in the different markets in Kumasi Metropolis remains hygienically unsatisfactory with potential negative public health implications.

In Ghana, the story is not different from other developing nations across the globe. Per the estimates of the Ministry of Food and Agriculture and the World Bank (2006), 1 in every 40 Ghanaian suffers foodborne disease or ailments annually which translates into 420,000 reported cases annually with the death rate of 65,000 which cost the government $69 million annually (World Bank, 2006).

> "*More than 200 diseases transmitted through food are known. The agents causing foodborne disease include viruses, bacteria, parasites, toxins, pesticides, industrial chemicals, metals and more recently, prions. The adverse health effects of foodborne diseases range from gastroenteritis to life-threatening conditions including cancer, birth defects, and neurological, hepatic, and renal syndromes*." (WHO, 2006).

Availability to safe and nutritious food is important for life and certainly the foundation for health. The conventional open food market is one of the key settings in the cities, especially in Ghana. The food market often serves as the trading and social centre of communities, reflecting

local culture and traditions of the people.(Guide, 2006). Woefully, markets in some cases have become associated with the spread of several emerging diseases. Sanitation, especially in the market is and continues to be one of the major challenges that many countries around the world encounter (Kumwenda, 2019). The impact of inadequate and poor sanitation on health is very enormous as the World Health Organization (WHO)/UNICEF (2010) put forth that, 7% and 8% of the worlds' deaths and global diseases respectively are caused by poor sanitation. Failure by stakeholders to act on sanitation works against the development of any society (Sanna-Leena *et al*., 2010) and with its negative impact on healthy markets. The promotion of healthy food markets has been introduced by the WHO as an approach to improving food safety and associated environmental health issues. In recent years, participation in healthy food markets has been significant, with pilot programs in all WHO regions being planned or introduced.

A Healthy Food Market is an ecosystem where all stakeholders work to provide the community with safe and nutritious food. A universal vision of a health-promoting food market that constantly strives to better serve the health and well-being of the community must be shared by all stakeholders, including local authorities, market managers, manufacturers, non-cooked food vendors, market queens, other food market staff, and consumers themselves. (WHO, 2006) The healthy food market is not an end, but a mutually beneficial mechanism that serves the interests of all stakeholders, especially the sellers and consumers of uncooked food. Depending on the local culture, social circumstances, food varieties and dietary preferences, food markets differ greatly from country to country. This essential function is at the centre of the WHO's Healthy Food Markets initiative which this research seeks to discuss for the benefit of consumers and our communities. The aim of this research is therefore to assess the major hygiene practices and other related factors among uncooked vegetable and fruit sellers at Ashaiman Central Market.

1.2 Problem Statement

Food-borne diseases are an important cause of morbidity and mortality, and a significant impediment to socioeconomic development worldwide, but the full extent and burden of unsafe food is unknown. Each year worldwide, unsafe food causes 600 million cases of foodborne diseases and 420 000 deaths. 30% of foodborne deaths occur among children under 5 years of age. (WHO, 2015). Moreover, in developing countries up to an estimated 70% of cases of diarrheal diseases are associated with the consumption of contaminated food. WHO estimated 16 million new cases and 600,000 deaths of typhoid fever each year. (WHO, 2015)

Food hygiene is mostly cited as a cause of food poisoning. Studies have shown that, there are always microorganisms in the environment. It has also been pointed out that, there are microbiological hazards associated with uncooked foods particularly livestock, fresh fruits and vegetables and the pathways for contamination, survival and persistence of these microbiological hazards start from the primary production of vegetables through to consumers (FAO/WHO 2008; Abass et al. 2016).

A huge concern is access to safe drinking water for urban vegetable irrigation in most developed countries. Thus, pathogen-laden wastewater is widely used (Amoah et al. 2006). In addition, relying on untreated waste or contaminated irrigation water contributes to unsustainable heavy metal build-up in soils, resulting in high levels of heavy metal absorption by crops (Karanja et al. 2010). Food is therefore likely to be contaminated at every stage before it gets to the end-user.

In developing countries (like Ghana), traditional outlets such as on-farm purchases, open-air markets, and kiosk vendors, remain important uncooked foods purchasing points for many consumers of urban vegetables. For example, most Ghanaian markets are marked by unhygienic

conditions, such as inadequate flow of clean water, poor drainage systems, dumping of unsanitary waste and congestion, resulting in poor personal hygiene. Despite the relatively unhygienic practices and inadequate sanitary standards in these sectors, most urban consumers in developed countries continue to be supplied by them (Tshirley & Ayieko 2008; Lagerkvist et al. 2013). This poses questions about public health. A research by Kutto et al. (2011) in Nairobi found that the major sources of pathogenic contamination of fresh vegetables were post-harvest handling and retail operations, with contamination levels higher in conventional markets than in high-end markets.

It is worth noting that, precise information on the burden of food-borne diseases can adequately inform policymakers, allowing them to allocate appropriate resources for food safety control and intervention efforts (WHO, 2006). On the other hand, those who produce food (farmers) and distribute food (sellers), obviously must respect rules of hygiene. Even more importantly, individual consumers should also be concerned about the food they eat (WHO, 2015) as well as where they buy their food to eat.

Numerous Studies have been done on food safety among food vendors in Ghana and other African countries. Amongst the studies not much has been done on how uncooked vegetables and fruits being sold in the market are handled before they reach the end-user. To help prevent the spread of food-borne illness, this study sought to contribute to the body of knowledge and thus improve hygiene practices among vegetable and fruit sellers to ensure food safety in our markets.

1.3 Justification

Food must be safe for consumers to eat. However, because of several risk factors surrounding the safety of food, they are exposed to contamination. Foodborne illnesses are prevalent in all parts of the world, and the toll in terms of human life and suffering is enormous.

Studies over the years have focused on street food vendors at the large and open markets in the cities, towns, and other urban areas. However, an insignificant number has looked at examining uncooked vegetables and fruits sold at the market. It is based on these research gaps that this study was conducted.

The study provided relevant information on hygiene practices among vegetable and fruit sellers at Ashaiman central market. This has contributed to knowledge especially in the dimension of Community Health, helped improve upon the quality of uncooked vegetables and fruits sold at Ashaiman Central Market in Ashaiman Municipality, helped streamline activities of uncooked vegetable and fruit sellers at Ashaiman Central Market.

1.4 Research Questions

i. What is the level of knowledge of uncooked vegetable and fruit sellers at Ashaiman market about food hygiene?

ii. What are the common practices of vegetable and fruit sellers towards food safety?

iii. What are the environmental conditions in the market that predispose vegetables and fruits to contamination?

iv. What factors are associated with hygiene practices among vegetable and fruit sellers?

1.5 Objectives of the study

1.5.1 General Objectives

- To assess the major hygiene practices among vegetable and fruit sellers at Ashaiman Central Market.

1.5.2 Specific Objectives

- To assess the knowledge and attitudes of vegetable and fruit sellers about food hygiene.
- To determine the practices of vegetable and fruit sellers towards food safety.
- To assess the environmental conditions in the market that predispose vegetables and fruits to contamination.
- To identify and describe other factors associated with hygiene practices among vegetable and fruit sellers.

1.6 Conceptual Framework on Hygiene Practices among Vegetable and Fruit Sellers

1.6.1 Narration of conceptual framework

The practice of good hygiene among vegetable and fruit sellers depends on several factors. The factors were looked at in the study from three broad angles.

First angle has to do with socio-demographic characteristics of market women (age, sex, educational level, and religion). Older women may most likely practice good food hygiene than younger vendors. Females may have better good food hygiene practices than men. Women with high educational level may have higher knowledge regarding food safety practices hence may have good food hygiene practices. Religious background of food vendors may vary their

practices regarding food hygiene. These socio-demographic characteristics may have some association with raw knowledge of food hygiene and food safety practices.

Second angle has to do with knowledge of food hygiene regarding transmission and prevention of foodborne diseases which may influence hygiene practices among food vendors.

Third angle talked about environmental conditions (such as proper refuse/waste disposal, access to clean water supply, access to toilet facilities, provision of dustbins with cover at vantage points) under which vegetables and fruits are kept may be influenced by socio-demographic characteristics such as age, sex, educational level and religion. These environmental conditions under which vegetables and fruits are kept may in turn affect over all food hygiene practices among vegetable and fruit sellers. All food hygiene practices can be assessed from the perspectives of these.

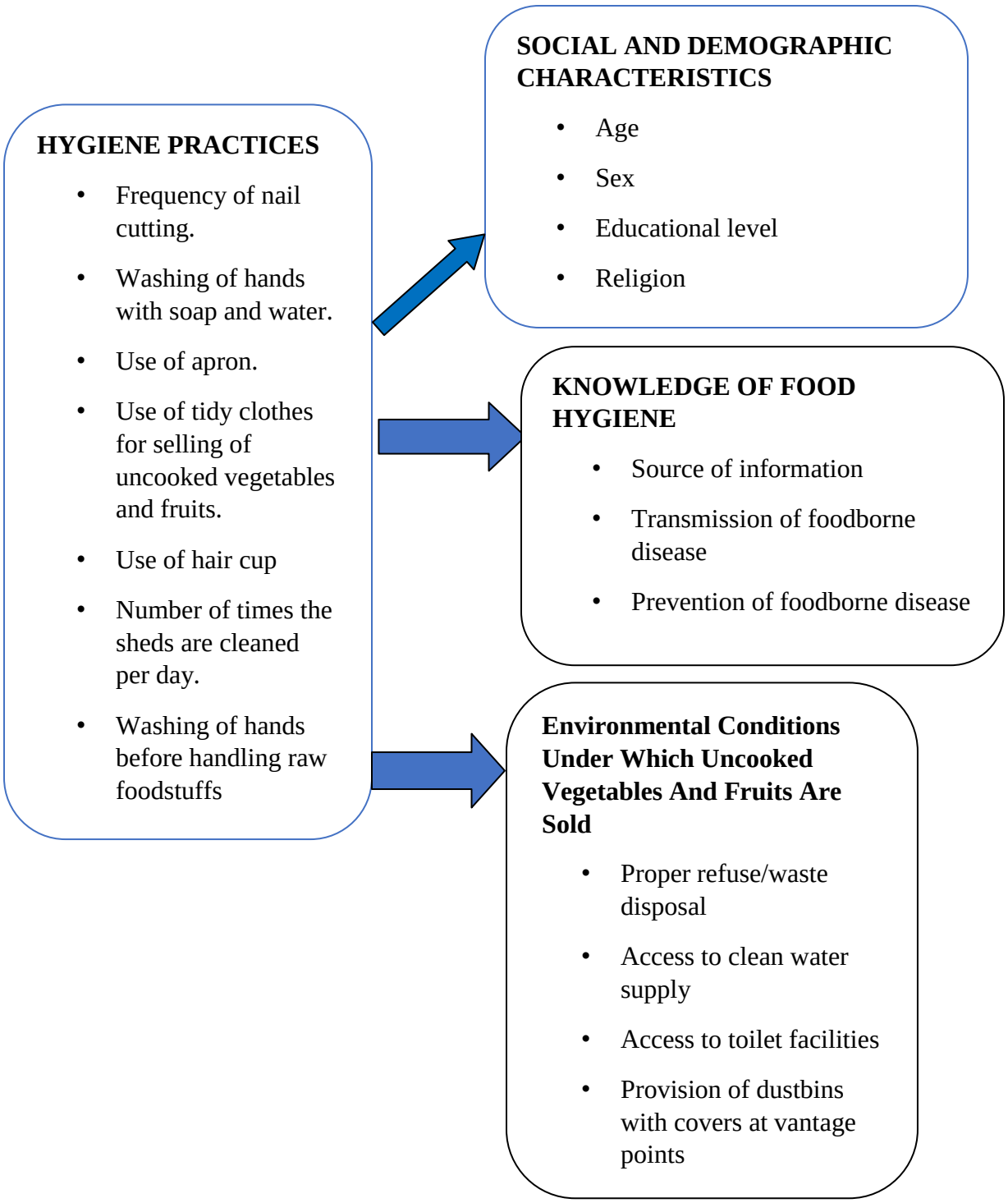

Figure 1.1: Conceptual Framework on Hygienic Practices among uncooked Vegetable and Fruits Sellers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to present the concepts and theories underpinning this study as well as empirical review of related work. The concepts of health, sanitation and hygiene were discussed. The theory underpinning the study is the theory of reasoned action. The literature was reviewed in accordance with the outlined objectives. The chapter concludes with deductive gap of the theories and findings of the literatures reviewed. The review focused on aspects of hygiene practices and other related factors and their relevance to this study as highlighted below.

2.3 Concept of Sanitation

Many definitions have been made for the concept of sanitation. According to WHO (2010), sanitation generally refers to the provision of facilities and services for the safe disposal of human urine and faeces. However, specifically WHO posited that sanitation refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal (WHO, 2010). Also, according to the Community Water and Sanitation Agency (CWSA, 2004), sanitation, involves the promotion of hygienic conditions as well as the proper disposal of solid waste and faecal matter. Sanitation involves the maintenance of hygienic, clean, and safe environment. It also involves a concerted effort to safely dispose of human excreta so as not to cause humans diseases and protect the environment as well (Frances & Gerlach, 2008). It also includes the following four infrastructural systems: excreta management systems, solid waste management, drainage systems for rainwater and wastewater management systems. From the above, it can be concluded that, sanitation encompasses the proper, safe, and sustainable

management of all kinds of waste to create hygienic living conditions and promote healthy living and thereby preventing diseases (Evans, van der Vooden, & Peal, 2009).

2.2 Concept of Health

Less logical recognition has been granted to health than to disease. In the case of wellness, the conceptual terrain is a bit more complicated than that of sickness. One school of thought notes that wellness is only the lack of illness, so if disease is a biological malfunction or abnormality, it follows that anyone whose biological processes are all in order is a good individual. Another school of thought suggests that it is not only the lack of illness, but something else that exists; a good state of mind (Murphy, 2015). WHO (2007) defines health as a state of complete physical, mental, and social well-being not merely the absence of disease or infirmity. Tones and Green (2004) concluded that, there are two broad approaches towards the concept of health – positive and negative. The positive approaches refer to fitness of the individual while the negative approaches focus on diseases and illness and thus see health as the absence of illness. The definition of health by the WHO falls within the positive approaches towards health. Furtherance to the above, health is also seen to be a right. The International Covenant on Economic, Social and Cultural Rights recognize that, all individuals have a right to health (WHO/UNICEF, 2008). The issue of health does not pertain to an individual since it is an international phenomenon. This calls for a collective effort to ensure that all individuals are in good health in every sphere of life including eating.

2.4 Concept of Hygiene

Hygiene is a series of practices performed to preserve health. According to WHO (2019) “hygiene refers to the conditions and practices that help to maintain health and prevent the

spread of diseases". Many people equate hygiene only with cleanliness, but hygiene is a broad term which encompasses among others, bathing, hand washing with soap, trimming of hair and fingernails, changing, and washing of clothes as well as cleaning our environment. The concept is linked to cleanliness, health, and medicine. It is also connected to procedures for personal and clinical treatment. Hygiene practices are used in medicine and daily life as preventive measures to minimize the occurrence and spread of diseases (Bloomfield, Aiello, Cookson, O'Boyle, & Larson, 2007). According to Stokes, Noren and Shindell (2000) and Hotor, (2017) this suggests that "the capability to execute personally valued family work, and community roles as well as the capacity to deal with physical, biological, psychological and social stress without befouling the environment will augment hygiene". This gives rise to the sentiment of well-being and prerogative from the risk of disease and untimely death (Stokes, Noren & Shindell, 2000). If uncooked food (vegetables and fruits) sellers see hygiene as pledge to wellbeing and long life, they will endeavour to put in place proper hygiene measures in their everyday life.

2.5 Theory of Reasoned Action

The theory of reasoned action was developed by Martin Fishbein and Icek Ajzen as an improvement over Information Integration theory (Arjen & Fishbein, 1980). According to the theory of reasoned action, behaviour is said to be roughly equivalent to behavioural intention, which can be interpreted from a mixture of the attitude of a person towards an act and behavioural subjective norms. The theory recognizes the ability of other people to influence behaviour by the idea of "subjective norm"; it specifically accounts for the thoughts of others on such behaviour and is moderated by the degree to which a customer or a seller is driven to accept proposed views. Though the theory is widely accepted and used because of the predictive nature, it has not gone free without facing criticism. Miller (2005), posits that "the relative contributions

of attitudes and subjective norms will not be equal in predicting behaviour depending on the individual's propensity to care about other's views, the consumption situation, or the product type under consideration, with conspicuously consumed products tending to be influenced to a greater degree by the subjective norm variable than less conspicuous products would be". (Ravasi & Schultz, 2006).

Juxtaposing the theory of reasoned action with the current study; the subjective views of buyers on how uncooked food are kept and preserved should propel sellers to hygienically store food. Since customers are kings and queens in the market, they would as much as possible look at all indicators such as price, quality of product, food safety and many more before making a commitment to buy. This knowledge of buyers' behaviour gathered by the seller should help them in preserving foods both cooked and uncooked. Furthermore, the theory links an individual's behaviour to a combination of an individual's attitude toward an act and the subjective norms about the behaviour. This means that buyers seen patronizing goods in an unkempt environment may be messy people or untidy persons. This could push customers away, thus the need to keep marketplaces where uncooked foods are sold very tidy.

2.6 Knowledge of Vegetable and Fruit Sellers about Food Hygiene.

According to Amor and Baiden (2011) "food and environmental hygiene are known to prevent several food-borne diseases when practiced. It is broadly acclaimed that, deliberate or accidental contamination of food due to improper handling of food might endanger the lives of consumers". Food is said to be hygienic when it contains no hazardous substance that could be harmful to human or animal health (Ababio & Adi, 2012). Several hygiene practices such as poor personal and environmental hygiene, inadequate storage of food and drinks, improper preparation and

cooking are known to compromise the safety of food (Odonkor, Adom, & Boatin, 2011). This necessitates an empirical evidence to be gathered on the knowledge of food sellers on food safety and food hygiene. Iwu, et al. (2017), studied knowledge, attitude, and practices of food hygiene among food vendors in Owerri, Imo State, Nigeria. The results revealed that, while most of the respondents had a good level of knowledge (81%) and positive attitude (71%) about food hygiene, only 37% of the respondents had a good level of hygienic practice.

Another study found that, market users at the Agbogbloshie market have an appreciable knowledge with respect to sanitation and health. Knowledge scores indicate that, market users' knowledge regarding sanitation and health at the Agbogbloshie market can be deemed to be moderate. The study also indicated that, market users at the Agbogbloshie market know that, open defecation as well as dumping refuse into gutters had implications for their health. The findings of Hotor commensurate with Worlanyo (2013) who concluded that, market users have considerable amount of general knowledge about sanitation, however, they were deficient in some areas too. Majority of market users had no knowledge that improper disposal of plastic materials contributed to poor sanitation in the environment.

2.7 Hygienic Practices and Food Safety

Globalization in food trade has emphasized attention on the need to strengthen measures that would guarantee quality and safety and different countries have developed specific regulations to ensure food safety and hygiene (Ojinnaka, 2011). Recently, cases of disease outbreaks have been recorded in Ghana, and Africa at large, which has made food safety a major public health concern (Apanga, Addah, & Sey, 2014). Throughout the different stages of the food chain - from harvest to consumption, organisms may be introduced into the food chain from a variety of

sources, and at different stages (WHO, 2007). This therefore calls for proper handling at each stage of the chain before final consumption. According to New South Wales Authority (NSW 2015), anyone who encounters food or handles surfaces that are likely to meet food must ensure food safety. This comes with responsibility to make sure all reasonable measures to ensure food hygiene is put in place. New South Wales Authority report further outlined that, all food handlers must ensure that, they are healthy, ensure effective hand washing, use gloves and be well-clothed and covered before handling food.

Dun-Dery and Addo (2016) studied food hygiene awareness, processing, and practice among street food vendors in Ghana. The outcome indicates a higher number of vendors who stick to common hygiene practices (87%).

Using direct observations and structured interviews Cortesea, Veirosa, Feldmanb, and Cavallia (2016) conducted a study among vendors at stationary locations in the downtown area Florianopolis, Brazil. The research aimed to investigate vendors' food safety and hygiene procedures in the street food supply chain. The research revealed that, among the food safety threats observed: 12% of vendors did not have ice for perishable ingredients at the point of sale; 95% did not wash hands during food and money transfers and toilet breaks; 91% did not provide hair coverings and 100% did not have access to water supply for the vendors. The interviews showed that during transport, 12% of the vendors did not have sufficient cold holding; 33% did not wash their hands at all, while 24% only used water to wash their hands; and 33% never took the necessary course in food handling.

2.8 Environmental Conditions in the Market that Predispose Uncooked Food to Contamination

Studies have shown how food is an important transmitter of diseases. Raw ingredients for preparing meals and uncooked foods left at home have been reported to contain a range of bacteria, viral or parasitic enteropathogenesis, (Boateng, 2014). There are between 103 and 108 micro-organisms per gram, the number of which certainly mounts up when the weight of an average meal is considered. For example, in a salad, which does not contain any cooked ingredients, several millions of potentially pathogenic micro-organisms are ingested in a single serving (Boateng, 2014). This throws light on the reason why uncooked foods must be well preserved. Studies on the epidemics of food borne disease all over the world show that, in almost all cases, they are triggered by failure to observe satisfactory standards in the preparation, processing, cooking, storing, or retailing of food both cooked and uncooked (Nigusse & Kumie, 2012).

Worlanyo 2013, assessed the knowledge, attitudes and practices of sanitation in the Dome market among market users. The methods to gather data from respondents were two survey manuals and focus group discussions including a descriptive-analytical strategy to collect data. Adults (18 +) who sell and purchase in the Dome Market were the target demographic. To survey 133 sellers, a relative likelihood was used; comfort sampling technique was used to select 23 buyers and focus group discussion was used to capture data from 12 sellers. They found that, most of the market users had inadequate education on good hygiene and basic sanitation promotion practices. As a result, they did not see the issue of improved sanitation as a current priority thus failed to change their lifestyle which could lead them to practice proper sanitation.

They also saw sanitation as an issue to be addressed by authorities, hence failed to take personal responsibility and initiative to maintain proper sanitation.

Furthermore, in the work of Hotor (2017), poor management of sanitation, apathy by market sellers for clean-up efforts and indiscriminate defecation activities were found to be the practice of market users. Quartey-Ankrah (2011) also concluded that, 40% of waste generators resorted to open dumping in and around the Kaneshie market. (Mara et al., 2010) in the book "Sanitation and Health" stated that, although market authorities at the markets believed in enforcement of the law and the prosecution of offenders as an effective means of improving sanitation, weak enforcement structures particularly in developing countries - like Ghana - contribute greatly to dumping in the open. Also, the lack of or the inadequacy of policies and regulations are detrimental to better sanitation. The above stated conditions in the marketplace could lead to food contamination if care is not taken to curb such menace in the marketplace where most foods including vegetables and fruits are sold.

2.9 Food Hygiene

Food hygiene is a series of basic principles used to ensure that food is safe to eat and of good quality during manufacturing, packaging, delivery or transportation, storage, processing, preparation, selling, and serving. (Ababio & Lovatt, 2015)

According to the World Health Organization (WHO), "Hygiene refers to conditions and practices that help to maintain health and prevent the spread of diseases". (WHO, 2020b)

The phrase "food hygiene" refers to the preservation and preparation of foods in such a way that it is safe for human consumption. Food safety is becoming more and more of a public health

concern. Governments across the globe are stepping up efforts to improve food safety. These efforts are being made in response to an increase in the number of food safety issues and customer complaints. Food safety refers to the process of monitoring food to ensure that it does not cause foodborne illness. (Fung, Wang, & Menon, 2018)

2.10 Knowledge of Food Hygiene

Learning processes, such as formal or informal instruction, personal experience, and experienced sharing, all contribute to the accumulation of knowledge. Knowledge has long been thought to naturally transform into behavior and habits. Knowing the repercussions of poor food hygiene can help people follow food safety requirements more closely. Food hygiene empirical research have been conducted all around the world. (Akabanda, Hlortsi, & Owusu-Kwarteng, 2017)

Knowledge is the ability to remember and understand facts, details and rules of things that have been experienced. According to Aiken et al, practices refer to the ways in which people demonstrate their knowledge and attitudes through their actions (Aiken, Clarke, Cheung, Sloane, & Silber, 2003).

2.11 Food Safety

Food safety is a vital issue both in developed and developing countries; given that foodborne illnesses cause a lot of distress and thousands of deaths each year (Keiji, 2015; WHO, 2020a). Given this, the issue of food safety is becoming a key public health priority considering many people who take uncooked vegetables and fruits outside the home. As a result of this lifestyle change, many people have been exposed to foodborne illnesses that originate from food stands, restaurants and other food outlets. World Health Organization's five keys to safer food are of

great significance in developing countries and furnishing food vendors with such knowledge would impact significantly on food safety. The most crucial food safety problem is a microbial foodborne illness. All those who come in contact with food, not excluding farmers, food producers, individuals who work in markets and food service establishments, and other food handlers, are obliged to keep food as safe as possible (Akabanda et al., 2017; Teffo & Tabit, 2020). To keep food safe, food handlers should make sure their hands and food contact surfaces are cleaned, and clean fruits and vegetables thoroughly; separate raw, cooked, and ready-to-eat foods; cook foods to a safe internal temperature; chill perishable food promptly; and defrost food properly. The Food and Drugs Authority (FDA) is the national regulatory body under the Ministry of Health and are obliged to implement food policies and ensure the safety and wholesomeness of food for consumers. FDA roles include food production and processing site inspections, licensing, product registration and monitoring. They also make sure food handlers go through training on good hygiene practices.

2.12 Environmental Hygiene and Transmission of Pathogens

Food hygiene and food quality are both influenced by environmental hygiene. Primary food production should not take place in regions where the presence of potentially dangerous substances would result in an unacceptable level of those substances in the food (Choyam, Srivastava, Shin, & Kammara, 2019) The underlying fact is that harmful microorganisms which are found in soil, water, and animals, can be transmitted through hands, wiping cloths , utensils and cutting boards into uncooked vegetables and fruits which can cause foodborne diseases. In respect of this, the FAO (1997) and WHO (2010) outlined measures of ensuring a hygienic environment for safe food preparation, including:

- ✓ Protection of food and food ingredients from contamination by pests or by chemical, physical or microbiological contaminants or other objectionable substances during handling, storage and transport;
- ✓ Discarding waste to avoid the accumulation of waste in food handling, food storage and other working area sand the adjoining environment.
- ✓ Adequate drainage and waste disposal system and facilities;
- ✓ An adequate supply of potable water and the construction of drainage systems that safeguard and avoid contamination of potable water;
- ✓ Washing and sanitizing all surfaces and equipment used for food preparation Several studies confirm that the hands are the most important transmitters of organisms from faeces, nose, skin or other sites to food.

2.13 Socio-demographic characteristics

Some factors related to food hygiene

Age: Studies conducted by Annor and Baiden (2011) and Soares, Almeida, Cerqueira, Carvalho, and Nunes (2012), the authors opined that age and sex do not appear to play a role in the food safety knowledge of street food. Forsythe (2009) in their study identified that the level of food safety knowledge associated with the socio-demographic characteristics shows a positive correlation. This means that academic level and age, which are both characteristics of socio demography, influence food safety knowledge positively.

Sex: Sanlier (2010) observed that food safety knowledge and practices between males and females showed dominance on the part of females in food preparation (cooked and uncooked) compared to males. However, in terms of knowledge, males and females were equal.

Education: A study has reported that educational levels influence food safety and the hygiene knowledge of street food vendors. It was evident in the study that respondents with higher academic qualifications showed a higher level of food safety skills than respondents with a lower academic qualification (Tabrizi, Nikniaz, Sadeghi-Bazargani, Farahbakhsh, & Nikniaz, 2017).

In addition, Hossen et al found that an increase in food safety knowledge is positively associated with the socio-demographic and academic variables (Hossen et al., 2020). However, the study by Annor and Baiden (2011) argued that a person‘s educational level does not guarantee a higher knowledge and attitude concerning food safety.

2.14 Deductive Gap

The section presents a summary of the gaps in literature concerning the issues under study. From the literature reviewed, many studies in Ghana have been done on of food hygiene among food sellers (Ababio & Adi, 2012; Amor & Baiden, 2011; Hotor, 2017 & Iwu, et al., 2017). However, none of these studies specifically looked at uncooked vegetable and fruit sellers. Most of the studies looked at cooked food sellers in general. Furthermore, hygiene awareness and practices have been thoroughly studied, however, interest has not been taken on the effect of uncooked vegetables and fruits. Lastly, it would also seem that a lot more work needs to be done on the environmental conditions that predispose uncooked vegetables and fruits to contamination which this research will endeavour to emphasize. (Hotor, 2017; Quartey-Ankrah, 2011; Worlanyo, 2013).

CHAPTER THREE

RESEARCH METHODS

3.0 Introduction

This section deals with the description of the methods and procedures employed in the study for the collection of pertinent data for the purpose of addressing the research questions. Areas to be covered include study area, study design, variables, study population, sample size, sampling method and procedure, data collection tools and technique, questionnaire design, quality control, data processing and analysis, ethical clearance, pre-test, study limitations and strengths of the study.

3.1 Study Area

The study was carried out in Ashaiman Central Market in the Ashaiman Municipality. Ashaiman Municipality is in the Greater Accra Region of Ghana with a population of 261,298 (Assembly, 2018). It is a peri-urban community that is densely populated and continually growing with the absorption of migrants from other parts of the country and neighbouring countries like Togo, Niger, Burkina Faso and Nigeria. Ashaiman Municipality is located about 4 kilometres to the North of Tema and about 30 kilometres from Accra, the capital of Ghana. Ashaiman falls within latitude 5,68974 North and longitude -0.0311 west. Ashaiman shares boundaries to the North and East with Kpone-Katamanso Municipal Assembly and to the South and West with Tema Metropolis and bordering with Adjei-Kojo of the Tema West Constituency. Its proximity to Tema and Accra makes it easy for community members to have access to high level social facilities and infrastructure such as good roads, water, hospital, and electricity. It also serves as a dormitory town for workers in most industries in the Tema Township.

Ashaiman is a cosmopolitan area which comprises large numbers of ethnic groups, but no specific cultural festival is observed. The construction of Tema harbour and the railway line in the 1950's, contributed to the migration of people to the area in search of jobs and for relatively less expensive accommodation as compared to Accra and Tema.

Ashaiman is a sprawling 'urban settlement' parts of which exhibit characteristics of a slum. This pertains especially around the core business area of the community.

Ashaiman has two main markets: Central market and Nii Annang Adjor market. The central market forms the largest market because of the vibrant commercial activities all year round. Ashaiman has well engineered drains along major roads in the township. Drainage within the central market area is, however, extremely poor as there are no well-engineered drainage system, creating problems of liquid waste disposal within the market.

The main agricultural activities include vegetables, rice, and maize cultivation-all done around the Ashaiman dam on the IDA lands. Irrigation farming is highly practiced within the area due to the dam. Ashaiman is also a vibrant market town where traders bring foodstuffs including vegetables and fruits from farming communities in Eastern and other regions of Ghana. This is due to its position as a township for industrial workers and labourers who work in the many industries in Tema, the industrial hub of Ghana as well as serving as market for consumers residing in the many adjoining / nearby communities like Tema Community 20, Afariwaa, Kpone-Katamanso. Afienya, Golf City, among others.

Ashaiman is a rapidly growing peri-urban community with lots of health-related challenges. The drainage situation in Ashaiman continues to affect the health of its citizens. The poor environmental conditions prevailing in most communities especially the market promote the

breeding of mosquitoes on stagnant water. Consequently, lots of uncooked vegetable and fruit sellers do not practice food hygiene, which made it particularly important to conduct the study to investigate the issues pertaining to the area.

Figure 3.1: District Map of Ashaiman Municipal

3.2 Study Design

To achieve the objectives of the study, a descriptive cross- sectional study design was adopted to assess the hygiene practices among vegetable and fruit sellers at Ashaiman Central Market. A quantitative approach was used that involved numerical representation and manipulation of observations for the purpose of describing and explaining the phenomenon that those observations reflect. Data were gathered using structured questionnaires.

3.3 Target Population

The study population constituted traders who sell vegetables and fruits and located at fixed points in the Ashaiman central market. These are the primary targets. This population was targeted because Ashaiman central market is one of the largest and rapid growing urban areas in

Ghana and well patronized by persons from different parts of Greater Accra, as such has poor sanitation issues. As a result of these, poor hygiene practice will pose public health treat to Greater Accra Region and the country at large.

3.3.1 Inclusion Criteria

The inclusion criteria comprised uncooked vegetable and fruit sellers at the Ashaiman Central Market at the time of data collection.

3.3.2 Exclusion Criteria

The exclusion criteria comprised 1) Uncooked vegetable and fruit sellers who did not give informed consent to participate in the study, 2) Uncooked vegetable and fruit sellers who were not at the market at the time of data collection, 3) Uncooked vegetable and fruit sellers who were below 18 years of age.

3.4 Variables

3.4.1 Dependent Variables / Outcome of Interest

Hygiene Practices (measured with a 14-item likert scale questionnaire with hygiene scores ranging from 14 to 70). Good hygiene practice was hygiene scores ≥ 55 and poor hygiene practice was hygiene scores ≤ 55. The cut off point ≥55 was chosen for good hygiene practice because the 55 score is more than half of the total score and over 3/4th of 70.

3.4.2 Independent Variables / Exposure

Knowledge level of uncooked vegetable and fruit sellers about food hygiene (measured with 15-item likert scale questionnaire with knowledge scores ranging from 15 to 75). Adequate knowledge was knowledge scores ≥ 60 and inadequate knowledge was knowledge scores ≤ 60. The cut off point ≥60 was chosen for adequate knowledge because the 60 score is more than half of the total score and over 3/4th of 75.

Socio-demographics (age, sex, educational level, marital status, religion, ethnicity).

Food safety practices (type of uncooked food sold, mode of preservation, water supply)

3.5 Sample Size Calculation

The sample size for the research was 358 uncooked vegetable and fruit sellers at the Ashaiman Central Market.

The sample size was computed using Cochrane's Formula based on hygiene practices, where:

Sample size $n=Z^2pq/e^2$

Outcome= expected % of uncooked vegetables and fruits sellers practicing good hygiene, p=37% or (0.37). Iwu, et al. (2017) studied knowledge, attitude, and practices of food hygiene among food vendors in Owerri, Imo State, only 37% of the respondents had a good level of hygienic practice.

q=1-p is 1-0.37=0.63

e=margin of error around p (0.05 or 5%)

z= critical value on standard normal giving desired confidence level in estimating p. For 95% confidence level, z= 1.96

Sample size $n=Z^2pq/e^2= (1.96)^2 (0.37x0.63)/ (0.05)^2 =358$

The sample size was increased to 370 to cater for 10% potential non-response rate.

3.6 Sampling Method and Procedure

Simple random sampling technique was employed for the quantitative study. Simple Random Sampling technique involves selecting participants randomly giving all members of the population an equal chance of being selected. Uncooked vegetable and fruit sellers in Ashaiman

Central market formed the sampling unit in the design. The Queen of the Market provided a list of 630 sellers dealing with vegetables and fruits. The list was identified by shed numbers with telephone numbers attached. Every individual on the list was assigned a number. A random number function (RAND) in Microsoft Excel was used to generate the random numbers.

3.7 Data Collection Tools and Techniques

The main data collection tools used for the study were structured questionnaires, face to face interviews and observational checklist. Participants were interviewed after their approvals were sort through informed consent. Data were collected by the researcher and two other research assistants through face-to-face interviews. Items in the questionnaires were translated into local languages during administration to the best of the understanding of the respondents,

3.7.1 Questionnaire Design

The questionnaire covered both open ended and close ended questions. The questionnaires were interviewer administered as this afforded the researcher the chance to throw light on any misunderstanding the participants had. The vegetable and fruit sellers were not willing to participate but after explaining to them the ethics involved, they consented. The exercise was conducted with the help of two research assistants who were trained prior to the data collection exercise.

Structured questionnaires were used to collect primary quantitative data from participants of the study. The questionnaire was designed to measure the objectives of the study in addition to socio-demographic characteristics of the participants. It was divided into four sections A, B, C and D as presented below.

Section A: Eight items on socio-demographic characteristics

These included age, gender, educational background, religion, marital status, place of residence, source of start-up capital and number of years in the business.

Section B: Nine items on food safety practices

These included types of uncooked vegetables and fruits sold, whether they wash them, how often they replace the water used for the washing of vegetables and fruits, the source of water for washing the vegetables and fruits, what they consider before buying the vegetables and fruits that they bring to the market to sell, how the vegetables and fruits are preserved before bringing them to the market to sell, what they physically look out for in the fruits and vegetables before purchasing them and whether there is constant supply of water at the place of selling.

Section C: Fifteen items on level of knowledge about food hygiene

The knowledge questionnaire contained items on the sources, methods of transmission and prevention of foodborne diseases. Knowledge level of uncooked vegetables and fruits sellers on food hygiene were measured with fifteen questions on a likert scale ranging from 1 to 5. The mean score of all the fifteen items was dichotomized into two (Adequate knowledge and inadequate knowledge). Those who had a mean of four (4) and above considered adequate knowledge representing (Agree and Strongly agree). Adequate knowledge was scored ≥ 60 and inadequate knowledge was scored ≤ 60.

Section D: Fourteen items on assessment of hygiene practices

Hygiene practices were measured with a list of variables that were scored using 14-item likert scale on a scale of 1 to 5.

Always	Very Often	Sometimes	Rarely	Never
5	4	3	2	1

- Regular nail cutting or nail trimming
- Washing of hands with soap and water before handling uncooked vegetables and fruits.
- Washing of hands with soap and water after handling uncooked vegetables and fruits.
- Use of clean aprons for selling of uncooked vegetables and fruits.
- Use of hair cap,
- Bathing before coming to sell the uncooked vegetables and fruits.
- Number of times the sheds are cleaned per day.
- Handwashing with soap and water after using the toilet or urinal.
- Display of vegetables in clean containers.
- Cover mouth while coughing,

In addition to measuring hygiene practices, for heat/cold-sensitive food items, the Principles of Hazard Analysis Critical Control Point System (HACCP) was used to assess critical control of potential hazards. This required the fulfilment of the underlisted provisions:

1. All food received were stored in the appropriate store (dry, chilled, frozen) in their original inner packaging where practical.
2. All food items received, stored, and handled in a manner that will prevent temperature variations and contamination.
3. Raw and ready -to-eat foods are stored separately, ideally in separate cool rooms.

The mean score of all the fourteen items were dichotomized into Good hygiene practice (hygiene score ≥55), and Poor hygiene practice (hygiene score <55). Those who had a mean of 4 and above considered good hygiene representing (very often and always).

3.7.2 Tools for environmental assessment-checklist

An observational checklist was used to assess the environmental conditions in the market that predispose the vegetables and fruits to contamination. An environmental checklist was also obtained from the Environmental Health Officer of the Ashaiman Municipal Assembly and used in addition to the observational checklist that the researcher developed to examine the environmental conditions in the market. Photographs were taken of these sites and practices to reinforce the data collected through the observations.

Figure 3.2: Tomato seller cleaning the tomatoes before displaying

Figure 3.3: Display of cucumber,green pepper and mango on trays for sale

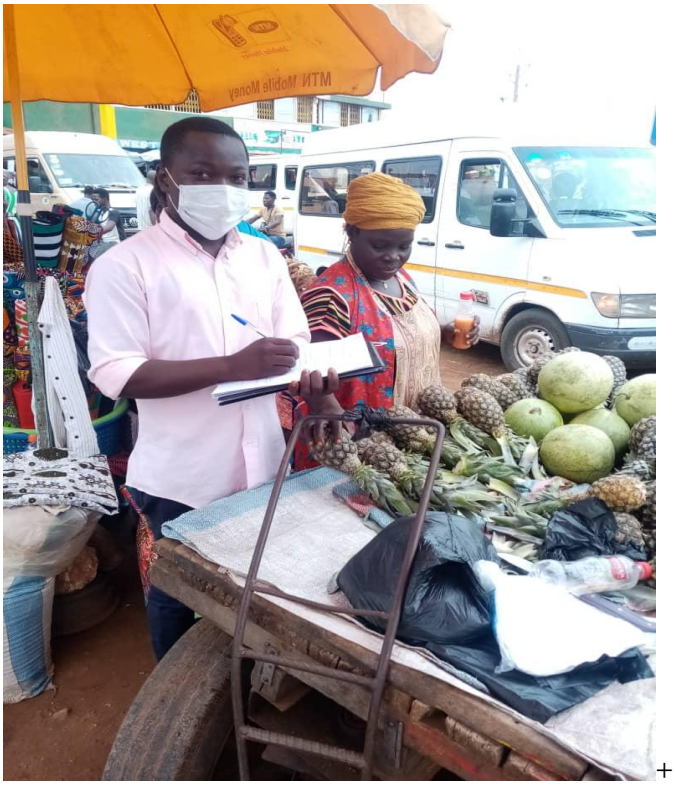

Figure 3.4: Display of pineapples and water melon on a truck for sale

Figure 3.5: Display of okro and pepper on trays for sale

3.8 Study duration

The duration of the study was one month, from June 1st to june30th 2021 done at Ashaiman Central Market in Ashaiman Municipality which lasted for four weeks.

3.9 Quality Control

The following steps were taken to certify the quality of data collected.

3.9.1 Pre-test of Data Collection Instrument

To guarantee the reliability and validity of the research instrument, the researcher conducted a pre-test of the quantitative instrument on ten (10) vegetable and fruit sellers at Dodowa market.

3.9.2 Review of Questionnaire

The pre-testing of the questionnaire instrument resulted in a review of the data collection instrument employed for the study. Sections that were reviewed included the wording of some of the questions and time preferences. The layout and pattern of the questions were also reviewed.

3.9.3 Training of Research Assistants

Two research assistants were recruited for the study. These research assistants were graduates who do similar jobs and spoke most of the local languages (Ga, Hausa, Ewe, Twi) but were further trained to obtain the expected results. The training involved the purpose and objectives of the study, data collection techniques and tools, and ethical issues.

3.10 Data Processing and Analysis

The data obtained from the field was checked for consistency and accuracy before analysis was done. Quantitative data in the form of answered questionnaires were checked, coded, and imported into STATA version 15.

The quantitative data were analyzed and interpreted with the use of descriptive statistics. The descriptive statistics were made up of frequencies and percentages derived from the structured questionnaire to analyze and interpret the findings. Statistical parameters: pie charts were also used to present quantitative data. The use of pie charts helped the researcher to provide pictorial evidence of the statistics.

Bivariate analysis (cross tabulations) was conducted using the demographic data and selected independent variables against hygiene practices. Chi-square test (Fisher's exact) and Logistic regression were used to test for the associations. All the associations were tested using a significance level of 5%. The results were expressed as p values, odds ratios, and confidence

interval. A p value of < 0.05 mean statistically significant and a p value of > 0.05 mean statistically insignificant.

3.11 Ethical Consideration

All data gathered were treated with high level of confidentiality. Ethical clearance was obtained from the Ghana Health Service Ethics Review Committee. Study participants were assured of strict confidentiality of every information they gave out. An introductory letter was taken from the Head of Department of Biological, Environmental and Occupational Health of the School of Public Health, University of Ghana. The letter was sent to Ashaiman Municipal Assembly's Environmental and Sanitation Unit for permission to carry out the study within the Ashaiman Central Market. The uncooked food (vegetables and fruits) sellers selected were made to give a written or verbal consent if they agreed to participate (see Appendix 2 for consent form). The study was entirely for academic purpose hence participants were not identified by names but rather coded during the dissemination of results.

3.12 Pre-test

The researcher pretested the study instruments at Dodowa market. This enabled the researcher to identify and refine some aspects of the questionnaire and figured out the methods best to pursue in carrying out the study. This also helped the researcher to estimate the length of time and resources necessary to complete the research. The reliability of the hygiene and knowledge assessment were tested using Cronbach alpha coefficient which were 0.8 and 0.85 respectively.

3.13 Study Limitations

This study focused on uncooked vegetable and fruit sellers in the Ashaiman Central Market therefore making generalization of the findings from this study to other markets is impossible.

Also, associations found are not temporal due to the cross-sectional study design used for the study.

3.14 Strengths of the study

Selection of participants was without biase. Quantitative method used in analyzing the data was logistic regression which gave empirical evidence of the factors associated with good hygiene.

CHAPTER FOUR

RESULTS

4.1 Socio-demographic characteristics of respondents

Table 4.1 shows the socio-demographic characteristics of respondents. The mean age of respondents was 35.8 years ± 10.8 SD. Majority of the respondents were female (96.5%). More than 75% of the respondents had had an education, 56.2% of whom had had basic education. Ninety percent (90.3%) of the respondents were Christians with 44.6% of them also married. More than half of the women (53.5%) had their start-up capital from other sources.

Table 4. 1 Socio-demographic characteristics of respondents (n = 370)

Variables	Frequency	Percent (%)
Age in years (M ± SD)	35.8 ± 10.8	
Gender		
Male	13	3.5
Female	357	96.5
Educational level		
None	71	19.2
Basic	208	56.2
Secondary	76	20.5
Tertiary	15	4.1
Religion		
Christian	334	90.3
Islamic	34	9.1
Traditional	1	0.3
Others	1	0.3
Marital status		
Single	118	31.9
Married	165	44.6
Divorced	39	10.5
Widowed	32	8.7
Cohabiting	16	4.3
Source of start-up capital		
Spouse	47	12.7
Parents	68	18.4
Relatives	25	6.8

Credit from banks	32	8.6
Others	198	53.5
Median years in business		
Range (1 year, 40 years)	6	

4.2 Proportion of vegetables and fruit sellers who had adequate knowledge about good hygiene practice

Out of the 370 respondents, 48.4% had adequate knowledge about good hygiene practices (percentage = 48.4%; 95% CI = 43.2% – 53.6%).

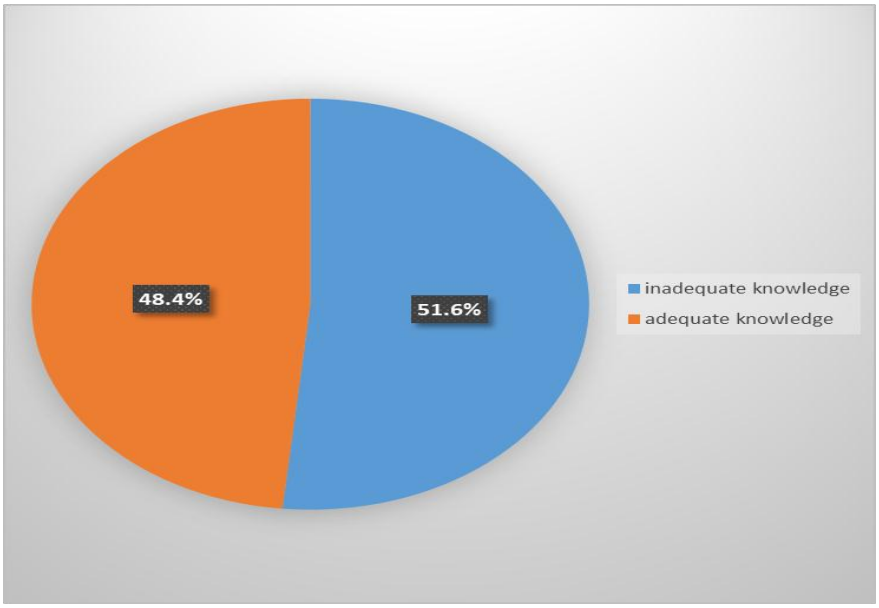

Figure 4.2 Knowledge about hygiene practices

4.3 Food safety practices

4.3.1 Consideration by vendors before bringing fruits and vegetables to market for sale

Almost all respondents (95.9%) and (95.7%) indicated cost and quality respectively as major factors considered before fruits and vegetables are brought to the market to sell. Nearly 91% of respondents also indicated looking out for rotten parts before purchasing fruits and vegetables.

Also, 84.1% of vendors looked out for the colour of the fruits and vegetables before purchasing.

(See table 4.3.1)

Table 4.3.1 Consideration by vendors before bringing fruits and vegetables to market for sale

	n (%)
Cost	355 (95.9)***
Quantity	266 (71.9)***
Quality	354 (95.7)***
Cultural background	1 (0.3)***
Physical outlook	
Worms	235 (63.5)***
rotten parts	336 (90.8)***
tender parts	158 (42.7)***
colour of the fruits and vegetables	311 (84.1)***
Not sure	1 (0.3)***

***multiple response

4.4 Proportion of vegetables and fruits sellers who practice good hygiene

Out of the 370 vegetables and fruit sellers, 64.9% practiced good hygiene (percentage = 64.9%; 95% CI = 59.8% – 69.7%).

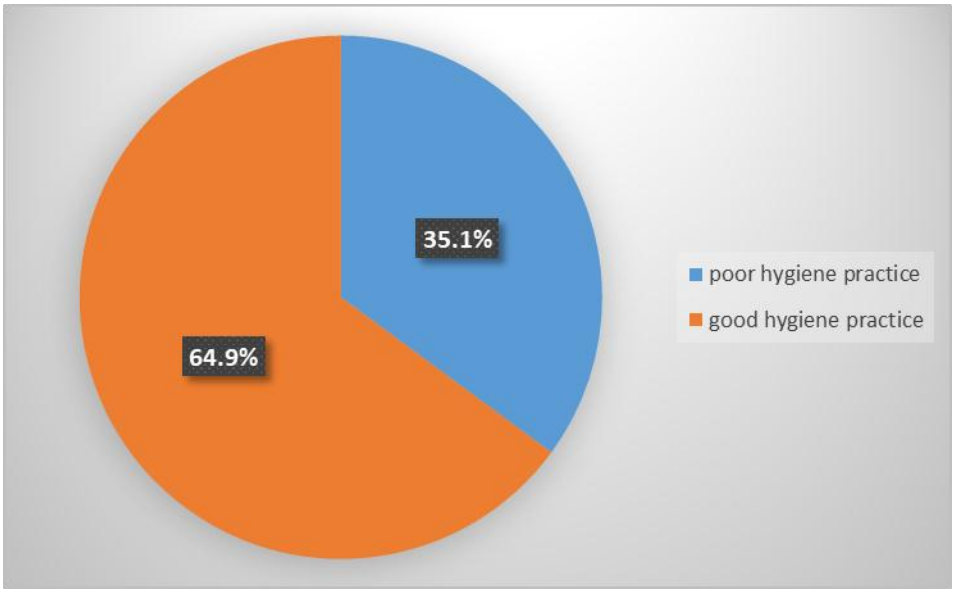

Figure 4.4 Hygiene practices among vegetables and fruits

4.5 Association between socio-demographic characteristics and good hygiene practices

Table 4.5 shows results of socio-demographic characteristics associated with good hygiene practice from bivariate analysis (chi-square and logistic regression). The odds of female vegetables and fruit sellers practicing good hygiene was significantly increased by 24.31 folds as compared to male vegetable and fruit sellers (cOR = 24.31; 95% CI = 3.12 – 189.15; p = 0.002).

Table 4.5 Association between socio-demographic characteristics and good hygiene practices

Variables	Hygiene practice		X^2	cOR (95% CI)	p-value
	Good (n = 240)	Poor (n = 130)	p-value		
Age in years					
(M ± SD)	36.4 ± 11.0	34.9 ± 10.5		1.01(0.99 - 1.03)	0.231
Gender			**< .001**		
Male	1(7.7)	12(92.3)		1.00	
Female	239(66.9)	118(33.1)		**24.31(3.12 - 189.15)**	**0.002***
Educational level			0.678		
None	49(69.0)	22(31.0)		1.00	
Basic	133(63.9)	75(36.1)		0.79(0.45 - 1.42)	0.439
Secondary	50(65.8)	26(34.2)		0.86(0.43 - 1.72)	0.677
Tertiary	8(53.3)	7(46.7)		0.51(0.17 - 1.59)	0.248
Religion			$^{+}$0.165		
Christian	213(63.8)	121(36.2)		1.00	
Islamic	26(76.5)	8(23.5)		1.85(0.81 - 4.21)	0.144
Traditional	0(0.0)	1(0.0)		1	
Others	1(0.0)	0(0.0)		1	
Marital status			0.205		
Single	76(64.4)	42(35.6)		1.00	
Married	107(64.9)	58(35.1)		1.02(0.62 - 1.67)	0.939
Divorced	23(59.0)	16(41.0)		0.79(0.38 - 1.67)	0.543
Widowed	26(81.3)	6(18.7)		2.39(0.91 - 6.28)	0.076
Cohabiting	8(50.0)	8(50.0)		0.55(0.19 - 1.58)	0.268
Source of start-up capital			0.685		
Spouse	31(66.0)	16(34.0)		1.00	
Parents	43(63.2)	25(36.8)		0.89(0.41 - 1.93)	0.765

Relatives	13(52.0)	12(48.0)		1.14(0.43 - 2.97)	0.250
Credit from banks	22(68.8)	10(31.2)		1.14(0.43 - 2.97)	0.795
Others	131(66.2)	67(33.8)		1.009(0.52 - 1.97)	0.979
Years in business	9.6 ± 8.5	9.4 ± 8.9		1.002(0.98 - 1.03)	0.846
Overall knowledge			0.680		
Inadequate knowledge	122(63.9)	69(36.1)		1.00	
Adequate knowledge	118(65.9)	61(34.1)		1.09(0.71 - 1.68)	0.680

[+] (fisher's exact) *(statistically significant, p≤0.05)

4.6 Association between food safety practices and good hygiene practices

From table 4.6 below, respondents who sold fruits had significantly 46% reduction in their odds of practicing good hygiene as compared to those who sold vegetables (cOR = 0.54; 95% CI = 0.33 – 0.87; p = 0.012).

Vegetables and fruits sellers who used other modes of preservation had 68% significant reduction in their odds of practicing good hygiene as compared to those who preserved their vegetables and fruits by keeping them in a cool dry place (cOR = 0.32; 95% CI = 0.17 – 0.59; p < 0.001).

Respondents who had no constant water supply at their selling point had 43% reduction in their odds of practicing good hygiene as compared to those who had constant water supply at their selling point (cOR = 0.57; 95% CI = 0.37 – 0.89; p = 0.013).

Table 4.6 Food safety practices associated with good hygiene practice

Variables	Hygiene practice		X^2	cOR (95% CI)	p-value
	Good (n = 240)	Poor (n = 130)	p-value		
Type of uncooked/raw foodstuff sold			**0.033***		
Vegetables	164(68.6)	75(31.4)		1.00	
Fruits	53(54.1)	45(45.9)		**0.54(0.33 - 0.87)**	**0.012***
Vegetables and fruits	23(69.7)	10(30.3)		1.05(0.48 - 2.32)	0.900
Washing of vegetables and fruits			**<.001**		
Yes	56(83.6)	11(16.4)		1.00	
No	184(60.7)	119(39.3)		**0.30(0.15 - 0.60)**	**0.001***
Source of water			+0.421		
Tap water	54(84.4)	10(15.6)		1.00	
Stored water in gallons	2(66.7)	1(33.3)		0.37(0.03 - 4.48)	0.435
Mode of preservation of fruits and vegetables			**< .001**		
Keeping in cool dry place	219(68.7)	100(31.3)		1.00	
Refrigerator	0(0.0)	0(0.0)		1	
Others	21(41.2)	30(58.8)		**0.32(0.17 - 0.59)**	**0.000***
Constant water supply at selling point			**0.012***		
Yes	166(69.5)	73(30.5)		1.00	
No	74(56.5)	57(43.5)		**0.57(0.37 - 0.89)**	**0.013***

+ (fisher's exact) *(statistically significant, p≤0.05)

4.7 Factors associated with good hygiene practices among vegetables and fruits sellers

Table 4.7 shows results from a multiple logistic regression to determine factors associated with good hygiene practices among vegetables and fruits sellers. Crude and adjusted odds ratio are presented in the table. Gender, type of uncooked/raw foodstuff sold, washing of vegetables and fruits, mode of preservation of fruits and vegetables and constant water supply at selling point were significant predictors of hygiene practices among the vendors.

The odds of female vegetables and fruits sellers practicing good hygiene was significantly increased by 24.31 folds as compared to male vegetable and fruit sellers (cOR = 24.31; 95% CI = 3.12 – 189.15; p = 0.002). However, after adjusting for all other variables, female vegetables and fruits sellers had significantly 17.95 times the odds of practicing good hygiene as compared to male vegetable and fruit sellers (aOR = 24.31; 95% CI = 3.12 – 189.15; p = 0.002).

Respondents who sold fruits had significantly 46% reduction in their odds of practicing good hygiene as compared to those who sold vegetables (cOR = 0.54; 95% CI = 0.33 – 0.87; p = 0.012). This association was found to be significant after adjusting for all other variables (aOR = 0.47; 95% CI = 0.25 – 0.88; p = 0.018).

Vegetables and fruits sellers who used other modes of preservation had 68% significant reduction in their odds of practicing good hygiene as compared to those who preserved their vegetables and fruits by keeping them in a cool dry place (cOR = 0.32; 95% CI = 0.17 – 0.59; p < 0.001). This association proved to be still significant after adjusting for all other variables (aOR = 0.28; 95% CI = 0.14 – 0.56; p < 0.001).

Respondents who had no constant water supply at their selling point had 43% reduction in their odds of practicing good hygiene as compared to those who had constant water supply at their selling point (cOR = 0.57; 95% CI = 0.37 – 0.89; p = 0.013). However, after adjusting for all other variables, this association proved to be significant (aOR = 0.57; 95% CI = 0.34 – 0.95; p = 0.032).

Table 4.7 Factors associated with good hygiene practices among vegetables and fruits sellers

Variables	cOR (95% CI)	p-value	aOR (95% CI)	p-value
Age in years	1.01(0.99 - 1.03)	0.231	1.01(0.97 - 1.04)	0.779
Gender				
Male	1.00			
Female	**24.31(3.12 - 189.15)**	**0.002***	**17.95(2.06 - 156.79)**	**0.009***
Educational level				
None	1.00		1.00	
Basic	0.79(0.45 - 1.42)	0.439	0.96(0.50 - 1.84)	0.909
Secondary	0.86(0.43 - 1.72)	0.677	0.92(0.40 - 2.09)	0.834
Tertiary	0.51(0.17 - 1.59)	0.248	0.49(0.13 - 1.82)	0.289
Religion				
Christian	1.00		1.00	
Islamic	1.85(0.81 - 4.21)	0.144	1.83(0.69 - 4.84)	0.220
Traditional	1		1	
Others	1		1	
Marital status				
Single	1.00		1.00	
Married	1.02(0.62 - 1.67)	0.939	1.12(0.56 - 2.21)	0.748
Divorced	0.79(0.38 - 1.67)	0.543	0.78(0.31 - 1.96)	0.594
Widowed	2.39(0.91 - 6.28)	0.076	3.11(0.88 - 10.98)	0.078
Cohabiting	0.55(0.19 - 1.58)	0.268	0.93(0.27 - 3.21)	0.910
Source of start-up capital				
Spouse	1.00		1.00	
Parents	0.89(0.41 - 1.93)	0.765	1.38(0.52 - 3.68)	0.516
Relatives	1.14(0.43 - 2.97)	0.250	0.74(0.22 - 2.47)	0.624
Credit from banks	1.14(0.43 - 2.97)	0.795	2.49(0.77 - 8.07)	0.128
Others	1.009(0.52 - 1.97)	0.979	1.38(0.63 - 3.03)	0.421
Years in business	1.002(0.98 - 1.03)	0.846	0.99(0.97 - 1.03)	0.961
Type of uncooked/raw foodstuff sold				
Vegetables	1.00		1.00	
Fruits	**0.54(0.33 - 0.87)**	**0.012***	**0.47(0.25 - 0.88)**	**0.018***
Vegetables and fruits	1.05(0.48 - 2.32)	0.900	1.33(0.53 - 3.31)	0.541
Washing of vegetables and fruits				
Yes	1.00		1.00	
No	**0.30(0.15 - 0.60)**	**0.001***	**0.23(0.10 - 0.51)**	**0.000***

Mode of preservation of fruits and vegetables				
Keeping in cool dry place	1.00		1.00	
Refrigerator	1		1	
Others	**0.32(0.17 - 0.59)**	**0.000***	**0.28(0.14 - 0.56)**	**0.000***
Constant water supply at selling point				
Yes	1.00		1.00	
No	**0.57(0.37 - 0.89)**	**0.013***	**0.57(0.34 - 0.95)**	**0.032***

*(statistically significant, $p \leq 0.05$)

4.8 Environmental conditions in the market that predispose uncooked fruits and vegetables to contamination

Using the observational checklist designed by the researcher to assess the environmental conditions in the market that predispose uncooked fruits and vegetables to contamination, it was found, as shown in table 4.7, that, the physical appearance of about 98% of vendors was neat. Nearly 65% of stalls or sheds were located by the roadside whereas 7.3% of stalls or shed were near open gutters. Only 3% of stalls or sheds were close to bushes and waste collection points. Generally, the sanitation of the place where most vendors (76.8%) sold their uncooked food was clean and neat. Majority of vendors (80.8%) did not have dustbins to keep waste with only (8.5%) having dustbins which were covered. Houseflies were observed in 29.2% of stalls or sheds where vegetables and fruits were sold. More than half (58.7%) of the fruit and vegetable vendors had soaps available for hand washing.

Table 4.8 Environmental conditions in the market that predispose uncooked fruits and vegetables to contamination

Observational checklist	Frequency	Percent (%)
Location		
Roadside		
Yes	239	64.6
No	131	35.4
Near open gutters		
Yes	27	7.3
No	343	92.7
Near covered gutters		
Yes	48	13.0
No	322	87.0
Close to bush		
Yes	12	3.2
No	358	96.8
Near waste collection point		
Yes	11	3.0
No	359	97.0
Sanitation		
Place of selling (clean and neat)		
Yes	284	76.8
No	86	23.2
Presence of garbage and refuse at place of selling		
Yes	75	20.3
No	294	79.7
Availability of dust bins to keep waste		
Yes	71	19.2
No	298	80.8
Availability of covered dustbins (n= 71)		
Yes	6	8.5
No	65	91.5
Presence of houseflies in the stalls or shed where vegetables and fruits are sold		

Yes	108	29.2
No	262	70.8
Availability of clean towels for wiping of hands after handling vegetables and fruits		
Yes	276	74.6
No	94	25.4
Availability of portable water		
Yes	148	40.0
No	222	60.0
Availability of clean water		
Yes	110	29.7
No	260	70.3
Availability of soap for hand washing		
Yes	217	58.7
No	153	41.3
Presence of domestic animals around the premises		
Yes	4	1.1
No	366	98.9
Availability of a covered water storage container		
Yes	59	15.9
No	311	84.1
Vegetables and fruits placed on the ground		
Yes	85	23.0
No	285	77.0

4.9 Municipal Assembly checklist for assessing vendors in the market

Assessment of hygiene in accordance with the checklist of the Environmental and Sanitation Unit of Ashaiman Municipal Assembly.

The Ashaiman municipal assembly has some under-listed checklist that vendors are expected to adhere to. Assessing the market women in accordance with the checklist of the Environmental and Sanitation Unit of Ashaiman Municipal. Vendors were found to mostly adhere to hygiene, however only 14.6% of vendors emptied trash cans regularly as shown in table 4.8 below.

Table 4.9 Assessment of hygiene in accordance with the checklist of the Environmental and Sanitation Unit of Ashaiman Municipal Assembly

Checklist for monitoring hygiene	Frequency	Percent (%)
Wear clean clothing and footwear		
Yes	365	98.7
No	5	1.4
Tie hair or wear a clean cap		
Yes	292	78.9
No	78	21.1
Keep market stall clean at all times		
Yes	313	84.6
No	57	15.4
Wash hands frequently where necessary		
Yes	204	55.1
No	166	44.9
Empty trash cans regularly		
Yes	54	14.6
No	316	85.4
Wear disposable gloves if there is a cut on the hand		
Yes	27	7.3
No	343	92.7

4.10 Assessment of sanitation practices at the Ashaiman market

Majority of the vendors (99.7%) sweep and collect waste in the market daily. However, 98.1% and 99.2% of vendors respectively indicated that drains were not desilted, and the market was not fumigated regularly. (See table 4.9)

Table 4.10 Assessment of sanitation practices at the Ashaiman market

Monitoring sanitation practices at the market	Frequency	Percent (%)
Sweep and collect waste in market daily		
Yes	369	99.7
No	1	0.3
Desilt drains in the market		
Yes	7	1.9
No	363	98.1
Fumigate market regularly		
Yes	3	0.8

No	367	99.2
Food stuff sold on tables or stalls		
Yes	251	67.8
No	119	32.2
Hygienic washrooms available in the market		
Yes	355	95.9
No	15	4.1

4.11 Assessment at the end of day sanitation and environmental practices

At the end of the day, majority of vendors (74.1%) indicated not washing and sanitizing all food containers and equipment. Also, 64.1% of vendors did not dispose of waste at the designated collection point (public refuse bin) as shown below in table 4.10.

Table 4.11 Assessment at the end of day sanitation and environmental practices

End of day checklist	Frequency	Percent (%)
Ensure all food containers and equipment are washed and sanitized		
Yes	96	25.9
No	274	74.1
Check dry storage area to ensure items are adequately shelved		
Yes	270	73.0
No	100	27.0
Dispose of waste at designated collection point (public refuse bin)		
Yes	133	35.9
No	237	64.1

4.12 Assessment of food safety at the Ashaiman market

Most of the food safety items in the checklist of the Environmental and Sanitation Unit of the Ashaiman Municipal Assembly were adhered to by the vendors with each item recording at least 75% of vendors adhering. However, 26.5% indicated not being able to ensure cereals were without maggots, weevils, and dampness. (See table 4.11).

Table 4.12 Assessment of food safety at the Ashaiman market

Food safety checklist	Frequency	Percent (%)
Ensure food is not in a state of decay		
Yes	366	98.9
No	4	1.1
Ensure food is not moldy or evidence of fungi		
Yes	362	97.8
No	8	2.2
Ensure food is safe at storage location		
Yes	349	94.3
No	21	5.7
Ensure food is not sold on bare ground or unhygienic environment		
Yes	282	76.2
No	88	23.8
Ensure food is not exposed to excessive temperature or sunshine		
Yes	278	75.1
No	92	24.9
Ensure absence of flies and rodents in surroundings		
Yes	298	80.5
No	72	19.5
Ensure cereals are without maggots, weevils, and dampness		
Yes	98	26.5
No	272	73.5

CHAPTER FIVE

DISCUSSION

With 55.4% of the respondents either single, divorced, widowed or cohabiting, this situation may have negative implications for their socio-economic wellbeing as single parents. The fact that majority of the women's start-up capital came from other sources may probably imply the difficulty in accessing financial support from financial institutions. This goes to buttress the point that, access to credit for women-run micro-enterprises may be difficult to improve their businesses a situation which goes further to deepen their socio-economic difficulties and marginalization. On the whole, 91.4% of respondent's sources of start-up capital came from either spouses, parents, relatives and other sources a situation which depicts the marginal survival income generating activities of fruits and vegetable sellers in the Ashaiman Central Market.

Majority of market women at the Ashaiman Market indicated cost (95.9%) and quality (95.7%) as major factors considered before fruits and vegetables are brought to the market for sale. Cost analysis is an important factor of sales in marketing. Analysing cost brings to bear the profit and loss margin as well as the marketability of the product. A product with a high-cost price will be difficult to sell at a higher price in an ordinary Ghanaian market like the Ashaiman market. Assessing fruit and vegetable quality aids in pricing and attraction of customers. A good quality product can easily attract buyers who are willing to purchase at a high selling price (Judd, 2000), since high quality commands a premium price (FAO, 1994). Quality also speaks volume concerning the healthiness of a food item since most of them are eaten raw (FAO, 2004). Hence,

it is not surprising that nearly 91% of the market women in this study look out for rotten parts while 84.1% look out for the colour of the fruits and vegetables before purchasing.

According to FAO (2004), the colour of fruits and vegetables is not enough indicator of freshness; buyer may have to touch the item to assess textural conditions. However, 26.5% indicated not being able to ensure cereals were without maggots, weevils, and dampness. Weevils are destructive grain pest that develop from the kernels resulting in dampness, mycotoxin contamination and maggot infestation (PennState Extension, 2017) rendering the cereals unsafe for consumption. Education measures are needed by market women in Ashaiman on how to identify infested cereals when purchasing from suppliers.

Out of the 370 vegetable and fruit sellers, only 48.4% had adequate knowledge of good hygiene practices while 64.9% practiced good hygiene. Whiles this is good, it could be improved with more education and training. Similarly, a study by Hotor (2017) assessing sanitary knowledge and practices of market users at the Agbogbloshie market in Accra also realised that majority of the users scored average on knowledge regarding sanitation and health. Another Ghanaian study assessed the knowledge, attitudes, and practices of sanitation among vendors at the Dome market. Most of the vendors exhibited inadequate knowledge on good hygiene and basic sanitation practices (Worlanyo, 2013). In Brazil, Cortesea et al., (2016) conducted a study among vendors revealing that more than 90% of vendors did not practice good hygiene habits. However, Dun-Dery and Addo (2016) on food hygiene awareness, processing, and practice among street food vendors in Ghana reported a greater percentage (87%) of vendors adhering to basic hygiene practices compared to what was realised in this current study. Iwu, et al. (2017) in

Owerri, Imo State, Nigeria also revealed that 81% of respondents had a good level of knowledge concerning food hygiene but only 37% of the respondents had a good level of hygiene practice.

The odds of female vegetables and fruits sellers practicing good hygiene was significantly increased as compared to male vegetable and fruit sellers. Gender based investigations by Suen et al. (2019) show that women generally have better hygiene practices than men. Another researcher reasons that women may possess intrinsic motivation for hygiene compared to men (Dadebo, 2018) hence the disparity in hygiene practice. It is also worth noting that, women are custodians of health and hygiene in homes so it is not very surprising that, they would be more focused on hygiene practices in the market, compared to their male counterparts. Respondents who sold fruits had significant reduction in their odds of practicing good hygiene as compared to those who sold vegetables. This may be because fruit sellers do not need to do much to fruits before displaying for sale as compared to vegetable sellers. Vegetable sellers need to wash and trim majority of their products before display to enhance consumer acceptability (FAO, 2004) hence it is not surprising that, current study results showed that vegetables and fruits sellers who do not wash their vegetables and fruits had significant reduction in their odds of practicing good hygiene as compared to those who washed their vegetables and fruits. The results also showed that respondents who had no constant water supply at their selling point had reduced odds of practicing good hygiene as compared to those who had constant water supply. Dajaan et al. (2018) also reported that 91% of vendors in Kintampo did not have access to running water. Having constant water supply is likely to boost cleanliness of a vendor's surrounding as well as items on sale (CDC, 2020; UN-water, 2010). Hence, it is important that municipal and market authorities provide a constant source of running water to aid in hygiene practices in the market.

Vegetables and fruits sellers who used other modes of preservation had significant reduction in their odds of practicing good hygiene as compared to those who preserved their vegetables and fruits by keeping them in a cool dry place. Preserving fruits and vegetables demand a safe, pest-free, well ventilated, and cool space (FAO, 2004). If a vendor fails to provide a space that meets the prescribed standard, the produce is likely to go bad or reduce in quality.

An observational checklist was used to assess the environmental conditions in the market that predispose fruits and vegetables to contamination. Majority (98%) of the food vendors appeared neat, 65% of stalls or sheds were located by the roadside, 7.3% were near open gutters, 3% were close to bushes and waste collection points. However, the possibility of dust pollution as a result of being located near the roadside was high. The place where most of the vendors (76.8%) sold turned out to be in good sanitary condition but 80.8% of the vendors did not have dustbins. Among those who had dustbins, only 8.5% covered their bins. Houseflies were observed in 29.2% of stalls or sheds where vegetables and fruits were sold. Approximately, 58.7% of the vendors had soaps available for hand washing. Similarly, only 61% of vendors in Kintampo had handwashing soap available (Dajaan et al., 2018). The market women were assessed using the Ashaiman Municipal Assembly checklist. Majority of vendors (75%) were found to mostly adhere to hygiene, however only 14.6% of vendors emptied trash cans regularly. About 99.7% of the vendors swept and collected waste daily while 98.1% and 99.2% of vendors respectively indicated that drains were not desilted, and the market was not fumigated regularly. This condition could result in breeding of rodents in the market and its attendant breakout of diseases. Majority of vendors (74.1%) did not wash and sanitize all food containers and equipment. Also, 64.1% of vendors did not dispose waste at the designated collection point.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Nearly 65% of vegetables and fruit sellers practiced good hygiene. Also, 48.4% had adequate knowledge of good hygiene practices.

Respondents who sold fruits had significantly 46% reduction in their odds of practicing good hygiene as compared to those who sold vegetables.

Vegetables and fruits sellers who used other modes of preservation had significantly reduced odds of practicing good hygiene as compared to those who preserved their vegetables and fruits by keeping them in a cool dry place.

Respondents who had no constant water supply at their selling point had significant reduction in their odds of practicing good hygiene as compared to those who had constant water supply at their selling point.

The physical appearance of about 98% of vendors was neat. Nearly 65% of stalls or sheds were located by the roadside. This could expose vegetables and fruits to dust pollution. Generally, the sanitation of the place where most vendors sold their uncooked food was clean and neat, though this could still be improved. Majority of vendors did not have dustbins to keep waste with only (8.5%) having dustbins which were covered. This situation could result in breeding of disease vectors such as rodents. Houseflies were observed in 29.2% of stalls or sheds where vegetables and fruits were sold. More than half (58.7%) of the fruit and vegetable vendors had soaps available for hand washing. While this may be good especially in the era of COVID-19, this could be improved as regular washing of hands periodically is known to prevent diseases including food-borne diseases.

Most of the food safety items in the checklist of the Environmental and Sanitation Unit of the Ashaiman Municipal Assembly were adhered to by the vendors with each item recording at least 75% of vendors adhering. However, 26.5% indicated not being able to ensure cereals were without maggots, weevils, and dampness.

6.2 Recommendations

1. Health Professionals and Environmental Health Officers should embark on routine food inspection and hygiene education among vegetables and fruits sellers at Ashaiman Central Market,
2. Environmental Health Officers should ensure continuous supervision of the cleanliness of the market environment.
3. There should be constant supply of dustbins with covers provided by the Ashaiman Municipal Assembly to vendors.
4. The Ashaiman Municipal Assembly must ensure regular water supply to the market area to enhance practice of food hygiene.

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APPENDICES

APPENDIX 1: QUESTIONNAIRE

UNIVERSITY OF GHANA

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF BIOLOGICAL, ENVIROMENTAL AND OCCUPATIONAL HEALTH

QUESTIONNAIRE FOR UNCOOKED/RAW FOOD SELLERS

I am Angelina Paula Ayensu, a Master of Public Health Student of the above institution. I am conducting a research titled **HYGIENE PRACTICES AMONG VEGETABLES AND FRUITS SELLERS AT ASHAIMAN MARKET IN ASHAIMAN MUNICIPAL, GHANA**. You have been selected to be part of the study by responding to these questionnaires as your contribution towards the improvement upon the quality of uncooked foodstuffs sold by the market women in the Municipality. It will take about 5 – 10 minutes of your time. Your responses will be treated with the confidentiality it deserves. You are kindly entreated to make a tick {√} to a response you deem appropriate or write in the spaces provided where specified or appropriate.

Thank you.

Participant Number…….

SECTION A: SOCIO- DEMOGRAPHIC INFORMATION

Characteristics	
1. Age (at your last birthday)	…….in years
2. Gender	1.Male [ ] 2.Female [ ]
3.Level of education of participant	1.None [ ] 2 .Basic [ ] 3.Secondary [ ] 4.Tertiary [ ]
4.Religion	1.Christian [ ] 2.Islamic [ ] 3.Traditional [ ] 4.Others…….
5.Marital Status	1. Single [ ] 2.Married [ ] 3. Divorced [ ] 4.Widowed [ ] 5. Cohabiting [ ]
6. Place of residence	……
7. Where did you get your start-up capital from?	1. Spouse [ ] 2. Parents [ ] 3. Relatives [ ] 4.Friends [ ] 5. Credit from banks [ ] Specify if others…..
8.How long have you been in this line of business in years?	

SECTION B: FOOD SAFETY PRACTICES

9. What type of uncooked/raw foodstuff do you sell?	1.Vegetables [ ] 2. Fruits [ ] 3. Vegetables and Fruits [ ]
10. Do you wash the vegetables and fruits?	1. Yes 2. No
11. If yes in (10) How often do you replace the water used to wash the fruits and vegetables?	1. once a day 2. every 6 hours 3. every 3 hours
12. What is the source of water for washing the fruits and vegetables?	1. tap water 2. Stored water in gallons 3. Bore hole water
13 What do you consider before you buy the fruits and vegetables that you bring to the market to sell? **(tick as many as apply)**	1. Cost [ ] 2. Quantity [ ] 3. Quality [ ] 4. Cultural background [ ] **5.** Not sure [ ]
14. How do you preserve the fruits and vegetables before bringing to the market to sell?	1.Refrigerator [ ] 2. Keeping in cool dry place [ ] 3. Other (specify……)
15. What do you physically look out for on the fruits and vegetables before purchasing them? **(tick as many as apply)**	1. Worms [ ] 2. Rotten parts [ ] 3. Tender parts [ ] 4. Colour of the fruits and vegetables [ ] 5. None of the above [ ] 6. Others, specify…….
16. Is there constant supply of water at the place of selling?	1.Yes[ ] 2.No[ ]

SECTION C

KNOWLEDGE LEVEL OF VEGETABLES AND FRUITS SELLERS ON FOOD HYGIENE

Knowledge items	**Strongly agree** **5**	**Agree** **4**	**Neutral** **3**	**Disagree** **2**	**Strongly disagree** **1**
K1 Food poisoning is caused by pathogenic microorganisms					
K2 Some toxins produced by microorganisms that cause food poisoning are resistant to heat					
K3 Transmission of foodborne diseases are caused contaminated raw foods					
K4 Consuming raw vegetables poses a high risk of food poisoning					
K5 Transmission of foodborne diseases are caused handling raw foods with contaminated hands					
K6 Consuming raw, unwashed vegetables poses a high risk of food poisoning					
K7 Consuming raw, unwashed fruits poses a high risk of food poisoning					
K8 Persons who come in contact with food, and do not respect hygienic practices, may be the source of microbiological contamination of food					
K9 Uncooked/ raw vegetables are not free from pathogenic micro-organisms					

K10 Uncooked/ raw vegetables which are kept at hot temperature for 24 hour or more poses a high risk of food poisoning					
K11 Washing hands with soap under running water before and after handling vegetables and fruits prevent foodborne diseases					
K12 Handwashing with soap under running water after using the toilet/urinal prevents foodborne diseases					
K13 Storage of food in refrigerator will slow down the growth of microorganisms, thereby decreases the possibility of food poisoning					
K14 Washing uncooked/raw foodstuffs with contaminated water causes foodborne diseases					
K15 Washing hands with soap under running water before handling uncooked/raw (vegetables and fruits) foods prevents the transmission of foodborne diseases					

SECTION D

ASSESSMENT OF HYGIENE PRACTICES

For the following hygiene practices, select from a scale of 1 to 5 how often you carry out these practices while selling in the market.

	Always **5**	**Very Often** **4**	**Sometimes** **3**	**Rarely** **2**	**Never** **1**
1.I regularly cut or trim my nails					
2.I wash my hands with soap and water before handling uncooked/raw foodstuffs					
3.Use of clean aprons for selling of uncooked / raw foodstuffs					
4. Use of haircap					
5. Bathing before coming to sell the uncooked /raw foodstuffs					
6. how often is your space in the sheds cleaned per day					
7. I leave the shed to the designated toilet/urinal any time I am pressed					
8.Handwashing with soap under running water after using the toilet or urinal					
9.Washing of vegetables with clean water before selling					
10. Display of vegetables in clean containers					
11. Cover mouth while coughing					
12. All food received are stored in the appropriate store (dry, chilled, frozen) in their original inner packaging where practical					
13. All food items received, stored and handled in a manner that will prevent temperature variations and contamination					
14. Raw and ready-to-eat foods should be stored separately, ideally in separate cool rooms. If this is not possible, ready-to-eat foods are to be stored on upper shelves above the raw foods.					

OBSERVATIONAL CHECKLIST FOR ASSESSING THE ENVIRONMENTAL CONDITIONS IN THE MARKET THAT PREDISPOSE UNCOOKED FOODS (FRUITS AND VEGETABLES) TO CONTAMINATION

ASHAIMAN CENTRAL MARKET

OBSERVATION CHECKLIST

Date: …… Unique ID No.: ……

Dear respondents,

This research seeks to study the Hygiene Practices among Uncooked Food (Vegetables and Fruits) Sellers in Ashaiman Market: and you happen to be one of my respondents on the issue. Confidentiality is assured. But before I start, I need to seek your permission and time to go ahead. Do you agree to be part of the study?

Yes, I agree/ No, I disagree

SERIAL NUMBER_____

1.YES 2.NO

1. Physical appearance of vendor: neat 1.Yes { } 2. No { }

2. Location of stall or shed where uncooked food is sold

i. Roadside 1. Yes { } 2. No { }

ii. Near open gutters 1. Yes { } 2. { }

iii. Near covered gutters 1. Yes { } 2. No { }

iv. Close to bush 1.Yes { } 2. No { }

v. Near the wastebin /waste collection point Yes { } 2. No { }

3. Sanitation of place of selling: clean and neat: 1. Yes { } 2. No { }

4. Presence of garbage and refuse at the place of selling 1.Yes { } 2. No { }

5. Availability of dust bins to keep waste 1. Yes { } 2. No { }

6. Availability of covered dustbins 1. Yes { } 2. No { }

7. Presence of houseflies in the stalls or shed where vegetables and fruits are sold

1. Yes { } 2. No { }

8. Availability of clean towels for wiping of hands after handling vegetables and fruits

1. Yes { } 2. No { }

9. Availability of potable water 1. Yes { } 2. No { }

10. Availability of clean water for washing hands before handling vegetables and fruits

1. Yes { } 2. No { }

11.Availability of soap for handwashing 1. Yes { } 2. No { }

12.Presence of domestic animals around the premises. 1. Yes { } 2. No { }

13.Availability of Storage Water container covered 1. Yes { } 2. No { }

14. Vegetables and fruits placed on the ground 1. Yes { } 2. No { }

APPENDIX 2: PARTICIPANT INFORMATION SHEET

Title: Hygiene Practices Among Uncooked Food Sellers at Ashaiman Market in Ashaiman Municipality, Ghana.

Hello

I am Angelina Paula Ayensu, a Masters student from the Public Health School, University of Ghana. I would like to request your participation in my study on Hygiene Practices Among Uncooked Food Sellers at Ashaiman Central Market in Ashaiman Municipality. This information leaflet is to let you fully understand what this study is about to help you make an informed decision to take part.

Background

Food hygiene is regularly cited as a cause of food poisoning. Major causes of food-borne diseases identified include, *Salmonella enterica, Salmonella* typhi, *Taenia solium,* hepatitis A virus and aflatoxin (WHO, 2015). Studies have shown that, there are always microorganisms in the environment. It has also been pointed out that, there are microbiological hazards associated with uncooked foods particularly livestock, fresh fruits and vegetables and the pathways for contamination, survival and persistence of these microbiological hazards start from the primary production of vegetables through to consumers (FAO/WHO 2008; Abass et al. 2016).

What is the purpose of this study?

The purpose of the study is to assess Hygiene Practices Among Uncooked Food Sellers at Ashaiman Central Market in Ashaiman Municipality. This will contribute to knowledge especially in the dimension of Community Health, help improve upon the quality of uncooked or raw foodstuffs sold at Ashaiman Central Market in Ashaiman Municipality, help streamline activities of uncooked or raw food sellers at Ashaiman Central Market.

What do I have to do in this study?

If you agree to take part in the study, you will be asked to sign an informed consent form. This will serve as proof of your consent to take part in the study and permission for me to use the information provided. A questionnaire will then be given to you to fill. This may take 10 to 15 minutes. Questions will cover your age, gender, religion, marital and educational, to know a little about yourself. After that, further questions will seek your opinion on food safety practices and level of knowledge on food hygiene.

What are the conditions that qualify me for the study?

You must be an adult, 18 years or older, and selling uncooked foodstuffs at the Ashaiman Central Market in the Ashaiman Municipality.

What are the risks of taking part in the study?

There are no risks of taking part in this study. The study does not involve any invasive procedure, and as such will not cause any harm or pain to study participants.

What are the benefits of participating in this study?

There are no direct benefits for participating in this study, however, the information you provide will inform policy, planning and interventions directed towards the improvement of the quality of uncooked or raw foodstuffs sold at Ashaiman Central Market in Ashaiman Municipality

What rights do you have as a participant in this study?

Participation in this study is entirely voluntary. You have the right to withdraw from the study at any time without any consequences to you. You also have the right to prevent me from using the information gathered even after filling the questionnaire.

Is there reimbursement for taking part in the study?

No payment to take part in this study.

How will confidentiality be maintained?

All information obtained from you will be kept confidential without mention being made of your name or any identifying information about you. Codes will be used instead of your name when references are being made to keep your identity anonymous.

Feedback to participants

Study results will be made available to participants.

Who is funding the study

The study is being sponsored by the principal investigator.

Who can I call for enquires?

A copy of the information sheet and the consent form will be made available to you after it has been signed. For further clarification about the study, you may contact me on telephone number +233 244839780 or Email: ayensupaula@gmail.com

Or my supervisor on telephone number 0208376845 or Email: mdzodzomenyo@ug.edu.gh

Regarding concerns over the conduct of the study, please contact Nana Abena Apatu, the administrator of the Ghana Health Service Research Ethics Committee, on telephone number 0503539896

Thank you

APPENDIX 3: CONSENT FORM FOR RESPONDENTS

Title: Hygiene Practices among uncooked food sellers at Ashaiman market in Ashaiman Municipality, Ghana.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand (English □a Ew□ Ak□ Ha□sa). I□ully understand the contents and any potential implications as well as my right to change my mind (ie withdraw from the research) even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant…….. ID Code ……

Participants' Signature …… OR Thumb Print…….

Date:……..

INTERPRETERS' STATEMENT

I interpreted the purpose and contents of the Participants' Information Sheet to the afore named participant to the best of my ability in (Akan □we □ Ga □Hausa)□anguage to his proper understanding.

All questions, appropriate clarifications sort by the participant and answers were also duly interpreted to his/her satisfaction.

Name of Interpreter……

Signature of Interpreter…….. Date:……

Contact Details

STATEMENT OF WITNESS

I was present when the purpose and contents of the Participant Information Sheet was read and explained satisfactorily to the participant in the language he/she understood (Akan ☐ Ewe ☐ Ga Hausa) ☐

I confirm that he/she was given the opportunity to ask questions/seek clarifications and same were duly answered to his/her satisfaction before voluntarily agreeing to be part of the research.

Name:…….

Signature……. OR Thumb Print …….....

Date:……

INVESTIGATOR STATEMENT AND SIGNATURE

I …… the undersigned certify that I have explained to the participant in the language he/she understands and he/she has agreed to take part in the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name…….

Signature ……..

Date……

Should you wish to contact me at any stage regarding consent you can contact me on Cellphone number +233 244839780 or Email: ayensupaula@gmail.com