

UNIVERSITY FOR DEVELOPMENT STUDIES

**NUTRITION KNOWLEDGE, ATTITUDES, FOOD SAFETY AND HYGIENIC
PRACTICES OF STREET FOOD VENDORS IN THE TAMALE METROPOLIS OF
GHANA**

YAKUBU MUBARIC

2022

UNIVERSITY FOR DEVELOPMENT STUDIES

**NUTRITION KNOWLEDGE, ATTITUDES, FOOD SAFETY AND HYGIENIC
PRACTICES OF STREET FOOD VENDORS IN THE TAMALE METROPOLIS OF
GHANA**

BY

YAKUBU MUBARIC

BSC COMMUNITY NUTRITION

(UDS/MPHN/0007/19)

**A THESIS SUBMITTED TO THE DEPARTMENT OF NUTRITIONAL SCIENCES,
SCHOOL OF ALLIED HEALTH SCIENCES, UNIVERSITY FOR DEVELOPMENT
STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
AWARD OF A MASTER OF PHILOSOPHY DEGREE IN PUBLIC HEALTH
NUTRITION**

APRIL, 2022

DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original work and that no part of it has been presented for another degree in this university or elsewhere, except where due acknowledgment has been made in the text.

Candidate's Signature: ----- Date: -----

Name: Yakubu Mubaric (UDS/MPHN/0007/19)

Supervisor's Declaration

I hereby declare that the preparation and presentation of this thesis was supervised by me in accordance with the guidelines on supervision of thesis as laid down by the University for Development Studies.

Supervisor's Signature: ----- Date: -----

Name: Associate Professor Victor Mogre

ABSTRACT

Increasingly most people have their meals outside their homes and are vulnerable to illness caused by unsafe food. Unsafe food preparation and supply by vendors have made food safety a concern for public health. Tamale is a densely populated city in the northern part of Ghana and many food vendors abound. This study evaluated the nutrition knowledge, attitude, and food safety and hygienic practices of food vendors in the Tamale Metropolis of the Northern region, Ghana. An analytical cross-sectional study on nutrition knowledge, attitudes towards, and food safety and hygienic practices was conducted among 424 food vendors. Convenience sampling technique was used to collect data using a structured questionnaire and analysed with Statistical Package for Social Sciences (SPSS V20). In all 83.5% were female food vendors, 47.2% had received training on food safety and 49.1% cooked their food on the site. The mean \pm SD score for nutrition knowledge was 7.08 ± 1.75 in which majority of the respondents (68.6 %) knew foods that help fight disease and builds immunity. The mean \pm SD food safety and hygienic practice score was 7.61 ± 2.66 with more than half of the respondents reportedly did not use hand gloves while preparing and serving food. Factors that were associated with food safety and hygienic practices of the street food vendors were level of education (beta = -0.36, $p < 0.001$), number of hours worked (beta = 0.15, $p = 0.002$), food hygiene and safety knowledge (beta = 0.21, $p = 0.002$), having a business certificate (beta = -0.15, $p = 0.004$), and having medical check-up (beta = 0.11, $p = 0.029$). The food safety and hygienic practices of the street food vendors were generally unsafe and may constitute food safety risk to consumers. Improving the food safety and hygiene knowledge may be an important at improving the food safety and hygienic practices of street food vendors.

ACKNOWLEDGEMENT

All praise and gratitude to Allah Almighty for he has been my way maker and protector throughout this program.

My profound gratitude goes to my supervisor, Dr. Victor Mogre, Associate Professor, and Head of Department of Health Professions Education and Innovative Learning, University for Development Studies (UDS), School of Medicine (SoM) for his guidance, valuable criticisms and vital contribution through the completion of this thesis.

I would also acknowledge all street food vendors who agreed and participated in the study. I very much appreciate the time they devoted during my data collection.

I wish to express my greatest gratitude to my family, especially Madam Yakubu Mary, for their support and encouragement.

Special thank you to Mr Mohammed Abdul Sabur, a special friend, for his invaluable contributions towards the completion of this thesis.

May the Almighty Allah bless each and every one who contributed in one way or the other towards the completion of this thesis.

DEDICATION

This work is dedicated to my beloved mother, Madam Lasani Amina for she has been there for me and supporting me through every aspect of my life, and to my siblings especially Madam Yakubu Mary for her immense support throughout this course.

TABLE OF CONTENTS

DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
DEDICATION	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES	ix
LIST OF TABLES	xi
ABBREVIATIONS	xii
OPERATIONAL DEFINITIONS	xiv
CHAPTER ONE	1
INTRODUCTION OF THE STUDY	1
1.0 Introduction	1
1.1 Background	1
1.2 Problem statement.....	3
1.3 Main research question	4
1.4 Research questions	4
1.5 Main objective of the Study	5
1.5.1 Specific Objectives	5
1.6 Significance of the Study	5
1.7 Organization of the Study	6
CHAPTER TWO	7
LITERATURE REVIEW (SCOPING REVIEW)	7
2.0 Introduction	7
2.1 Background of Scoping Review	7
2.2 Purpose and Objective of Review	9
2.3 Methodology.....	9
2.3.1 Identifying the Relevant Studies.....	9
2.3.3 Search Criteria	10
2.3.4 Study selection.....	10
2.3.5 Charting the Data, Summarizing and Reporting the Findings.....	10
2.4 Data analysis and synthesis	11
2.5 Results.....	11
2.6 Characteristics of the included studies.....	13
2.7 The nutrition knowledge of food vendors reported in the literature from LMICs.	23

2.8 Food safety and hygienic knowledge of SFVs	23
2.9 Attitude of SFVs towards food safety and hygienic practices.....	24
2.10 Food safety and hygienic practices SFVs from LMICs.....	24
2.11 Factors associated with food safety and hygienic practices of SFVs in LMICs.	25
2.12 Conclusion on scoping review	27
CHAPTER THREE	28
METHODOLOGY	28
3.0 Introduction	28
3.1 Study Setting/area	28
3.2 Study Design.....	29
3.3 Study population/participants	30
3.4 Inclusion and exclusion criteria	30
3.5 Sample Size Determination	30
3.6 Sampling and sampling techniques	31
3.7 Study variables.....	31
3.8 Data Collection Procedures.....	31
3.9 Data collection methods.....	32
3.11 Data analysis and presentation of results	34
3.12 Quality control issues.....	34
CHAPTER FOUR.....	35
RESULTS OF THE STUDY.....	35
4.0 Introduction	35
4.1 Socio-Demographic and general characteristics of the Respondents	35
4.2: Operational Characteristics	37
4.2.1: Food normally sold by SFVs	37
4.2.2 Operational Characteristics of street food vendors.....	38
4.3 Nutrition knowledge of the Respondents	40
4.5 Food safety knowledge	41
4.6: Food safety and hygienic practice.....	43
4.7: Attitudes of SFVs toward food safety and hygienic practice	46
4.8 Univariate analysis of factors associated with food safety and hygienic practice scores	47
4.10 Multiple linear regression analysis of factors associated with food safety and hygienic practice scores.....	51
CHAPTER FIVE	54
DISCUSSION	54
5.0 Introduction	54
5.1 Socio-demographic and general characteristics of the Respondents	55

5.2 Operational characteristics of the Respondents	56
5.3 Nutrition knowledge of the Respondents	58
5.4 Food safety knowledge of SFVs in the Tamale metropolis	59
5.5 Attitudes of SFVs towards food safety and hygienic practice in the Tamale metropolis	59
5.6 Food safety and hygienic practice of SFVs in the Tamale metropolis	60
5.7 Factors associated with food safety and hygienic practices of SFVs in the Tamale Metropolis	62
5.8 Strengths and Limitations of the Study	64
5.9 Implications of the findings of the study to clinical and public health	65
CHAPTER SIX	66
SUMMARY, CONCLUSION AND RECOMMENDATION	66
6.0 Introduction	66
6.1 Summary of the findings	66
6.2 Conclusion	67
6.3 Recommendations	68
6.4 Suggestion for Further Study	68
REFERENCES	70
APPENDIX 1: QUESTIONNAIRES	77
APPENDIX 2: ETHICAL CLEARANCE	88
APPENDIX 3: LETTER FROM STUDY AREA	89

LIST OF FIGURES

Figure 2.1: Various stakeholders in attitude and hygienic food management practices	8
---	---

Figure 2.2: Multistep process for study selection and inclusion.....	12
Figure 2.3: Number of articles by various years of publications	21
Figure 2.4 Type of Study Design used in included articles	22
Figure 2.5: Number of articles by various countries of publication	22
Figure 3.1: Map of Tamale Metropolis	29
Figure 4.1: Food normally sold by food vendors.....	38

LIST OF TABLES

Table 2.1: Characteristics of included studies	13
Table 4.1: Socio-Demographic and general characteristics of the respondents	36
Table 4.2: Operational Characteristics of street food vendors	38
Table 4.3: Nutrition knowledge of the respondents	40
Table 4.4: Food safety knowledge	41
Table 4.5: Food safety and hygiene practice (checklist)	43
Table 4.6: Attitudes of street food vendors towards food safety and hygienic practice	46
Table 4.7: Mean (SD) food safety and hygienic practice score stratified by general and socio-demographic characteristics	48
Table 4.8: Correlation analysis among related factors and food safety and hygienic practice score of food vendors	50
Table 4.9: Multiple linear regression analysis of factors associated with food safety and hygienic practice scores	52

ABBREVIATIONS

FAO	Food and Agriculture Organization
WHO	World Health Organization
LMICS	Low and Middle-Income Countries
MESH	Medical Subject Headings
PRISMA	Preferred Reporting Items for Systematic and Meta- Analysis
JBI	Joanna Briggs Institute
KAP	Knowledge, Attitude and Practices
FT	Food Truck
FH	Food Hygiene
PHC	Population and Housing Census
EHPE	Committee on Human Research and Publication Ethics
KNUST	Kwame Nkrumah University of Science and Technology
SPSS	Statistical Package for the Social Sciences
Dw/W	Days work per week
Hw/D	Hours work per day
FSK	Food Safety Knowledge
FSA	Food Safety Attitude
FSP	Food Safety Practice
NK	Nutrition Knowledge

WE	Workers employed
D	Disagreed
N	Neutral
A	Agreed
SFVs	Street food vendors
FDA	Food and Drugs Authority

OPERATIONAL DEFINITIONS

According to the World Health Organization (2016), the following are defined as;

1. Food Vendor: A person who sells food is known as a food seller. A food merchant, on the other hand, could 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 series of procedures used to keep one's health in good shape.
4. Street Vended foods: Foods and beverages prepared and/or sold by vendors on streets and other public places for immediate consumption or consumption at a later time without further processing or preparation.
5. Food Hygiene: It is the action of ensuring that food is handled, stored, prepared, and served under hygienic circumstances in order to prevent food contamination as much as possible.
6. Food Safety: A scientific discipline describing handling, preparation and storage of foods in ways that prevent foodborne illness.
7. Foodborne disease is an infection or irritation of the gastrointestinal tract caused by bacteria, parasites, viruses, or chemicals found in food or beverages.
8. Personal Hygiene: The act of preserving or maintaining the body and clothing to preserve overall 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.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter comprises of the overview that gives a background to the research topic, the problem statement, research questions, study objectives. In addition, it provides a description of the significance of the study.

1.1 Background

Foods that are edible and usually sold in the streets and places with less than four walls are considered to be street foods (Gelormini et al., 2015). Globally, a high figure of the population depends on food vendors because of how it is easily accessible and convenient especially to students and the non-married (Iwu et al., 2017). Food vendors are mainly found on the streets and provide benefits such as provision of variability of low cost, suitable food, delivery of employment and income particularly for women (Muyanja et al., 2011). Despite the benefits that these food vendors render, they also pose some dangers to the consumers given that food sold is generally high in energy and salt which could contribute greatly to weight improvement and exposure to the health concerns associated with overconsumption of total fat, salt, and refined sugars (Labadarios et al., 2011). Additional danger to public well-being is the general cleanliness and safety of the street foods since many countries do not regulate the activities of street food vendor (Hill et al., 2019).

The nutrition and food hygienic knowledge of the food vendors is very critical particularly given the presence of all kinds of people who may be more susceptible to nutritional and microbiological concerns than healthy people as a result of preparing contaminated food (Muyanja et al., 2011). For instance, a study in Uganda indicated that about 70% of food

vendors do not have hygiene regulations and operate in poor structures (Muyanja et al., 2011). Even though a study by Chukuezi, (2010), revealed that about 24 % of food vendors prepare food under unhygienic conditions, it still raises serious public health concerns.

In the year 2015, the World Health Organization theme was “Food safety” and “farm to plate and make food safe” was the slogan, this places emphasis on the need to globally address the dangers posed by contaminated food which leads to the interruption of food hygiene with the consequent danger of food borne illnesses (Iwu et al., 2017).

In 2016, a study in Nigeria disclosed that a high (81%) number of food vendors had good level of understanding on food hygiene which is a component of nutrition (Iwu et al., 2017). A study in Nigeria recommended the need to control and monitor food vendor’s nutrition knowledge and practice by local authorities (Iwu et al., 2017). Yet, it is important noting that knowledge does not necessarily translate to practices or attitude. Omemu & Aderoju, (2008) reported that vendors' expertise might not be converted into reality as a result of lack of elementary amenities such as electricity, toilets and water at their vending sites.

Street food vendors provide a crucial service to employees, shoppers, travellers, and those on low incomes by supplying snacks, entire meals, and drinks at comparatively affordable prices. People who rely on such cuisine are frequently more concerned with its suitability than with its safety, quality, or hygiene (Mensah et al., 2002).

1.2 Problem statement

The proliferation of street food sellers has led to the idea that, from their very own ways, contamination of streets food is unavoidable; millions of people yet still rely on this foundation for nutrition (Lamin-Boima, 2017). According to the Food and Agriculture Organization (FAO), cited in Lamuka, (2014), street food is defined "already cooked foods and beverages sold on streets or other public places by hawkers". For many people in poor countries, food vendors provide a convenient diet. Every day, about 2.5 billion people consume foods on the street, which supports the livings of masses of low-income individuals while also contributing meaningfully to the economy (Liu et al., 2014). Food vendors have long been a part of Ghanaian culture. Locals and visitors alike may find street food vendors in most cities, and food vendors have become an integral part of Ghanaian culture. As a result, food safety and nutrient content have been a source of worry, and it has been demonstrated that food is served in filthy and sloppy settings (Samapundo et al., 2015). Majority of fast-food vendors are untrained and frequently ignorant, and there is little effective regulatory or supervisory monitoring (Lues et al., 2006). Food vendors have been linked to outbreaks of foodborne infections in various poor countries (Aluko et al., 2014). In numerous nations, high quantities of coliform bacteria have been discovered in street foods (Hanashiro et al., 2005), and street foods has been recognized as a shared mode of antimicrobial-resistant disease transmission (Aluko et al., 2014).

Street food sellers are an imperative part of the "farm to plate" food safety field, which is important for the prevention and management of foodborne illnesses (Iwu et al., 2017). World Health Organization (2016) reported that, nearly one person out of ten people gets sick after eating polluted food, and 420000 people die each year from diarrheal disease, subsequently leading to loss of 33 million healthy life years. Diarrhea is caused primarily by ingesting contaminated food and drinking water (Franz et al., 2019). The number of persons working in

the food vending industry has increased dramatically. As a result, consumers are vulnerable to food-borne ailments spread by restaurants and other food establishments (Rahman et al., 2012). There is thus the need for research to focus on those who involved in the food vending business. The nutrition related information, behaviors and practices of food safety is very critical. However, there is scarcity of data on nutrition knowledge, behaviors and skills of food vendors globally (Hill et al., 2019). Studies have been extensively conducted on knowledge, behavior and skills in relation to food safety, food hygiene and others. However, studies on nutrition awareness, behavior and practices are limited, particularly in Ghana with respect to knowledge on nutrients, their roles and sources. Also, personal hygiene and food safety is a component of nutrition which most food vendors lack. Food employees serve as an important interface between food and customers. Material on nutrition awareness, behavior and practices of fast-food vendors would help improve the health of the general population since this would help the relevant authorities to organize training and workshops related to nutrition knowledge, attitudes and practice as well as food safety and cleanliness for fast-food vendors.

1.3 Main research question

What is the nutrition knowledge, attitudes towards nutrition, food safety and food hygienic practices of street food vendors in the Tamale Metropolis of the Northern Region of Ghana?

1.4 Research questions

1. What is the nutrition knowledge of street food vendors in the Tamale Metropolis?
2. What are the behavior of street food vendors towards nutrition in the Tamale Metropolis?
3. What are the food safety and hygienic practices of fast-food vendors in the Tamale Metropolis?

4. What are the factors associated with food safety and hygienic practices of street food vendors in the Tamale Metropolis?

1.5 Main objective of the Study

To evaluate the nutrition knowledge, attitudes towards nutrition, as well as food safety and food hygienic practices of street food vendors in the Tamale Metropolis of the Northern Region of Ghana.

1.5.1 Specific Objectives

1. To determine the nutrition knowledge of street food vendors in the Tamale Metropolis.
2. To assess the attitude of SFVs towards nutrition in the Tamale metropolis.
3. To evaluate food safety and hygienic practices of SFVs in the Tamale Metropolis?
4. To determine the factors that are associated with food safety and hygienic practices of SFVs in the Tamale Metropolis.

1.6 Significance of the Study

Public health Practitioners, the people of Tamale, students at the University for Development Studies, researchers, and the government in general would benefit greatly from the conclusions of this study. It will be used as a resource for future research on any subject connected to nutritional awareness, behaviour, and practices of food sellers for the students. The study will contribute to the existing empirical literature on food hygiene as well as academia. It will assist practitioners in making well-informed decisions. Given that this area employs the vast majority of people, it is critical that the study be carried out. Breaches in food safety and hygiene practice among SFVs can be found through this study, which will help to inform the establishment of a more particularly targeted and effective training program for these individuals. As a result, consumer confidence and regulatory control in street food vending may be accomplished, and the negative impacts of food poisoning events on both consumers and the city can be reduced.

It will provide evidence-based information to the government and researchers, including policymakers, on the ways to ensure proper hygienic procedures by food vendors, the right set of regulations and exercises should be created and enforced, as well as provide evidence-based information that will inform policy directions. The study's findings will also guide policy and practice on food vendor safety management and practices across various streets, educational and non-educational institutions in the country, ensuring that the appropriate actions are taken and applied to lessen the devastating effect of foodborne diseases and infection on the country's population.

The findings of this study would also be valuable in terms of helping public health experts to design food and nutrition policies to ensure the general safety of the public. This study would help government regulating bodies to ensure effective regulation and compliance to food safety and hygienic practice of SFVs.

1.7 Organization of the Study

The study is broken into six (6) main chapters. Chapter one is labelled the first section of study, and covers: an introduction of the study with background, problem statement, research objectives, research questions, relevance of the study. The second chapter contains analysis and review of relevant literature concerning the subject under study. The third chapter will give a comprehensive description of the methodology to be used for the study by specifying the research design, research population and sampling design, data collection and analysis. Results of the study are presented and discussed in the fourth and fifth chapters respectively. The summary, conclusion and recommendations from the study are contained in the sixth chapter.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section explores the literature on nutrition knowledge, behaviour and practice among SFVs in low- and middle-income-countries from 2015 to 2020.

2.1 Background of Scoping Review

According to the Food and Agriculture Organization, foods that are already cooked and usually sold in the streets and places with less than four walls are considered to be street foods (FAO, 2005). Food vendors are one of the key sources to public health and as a matter of fact, food vending is the key source of income for households in developing country (Muyanja et al., 2011). Globally, a high number of the population depends on food vendors because of how it is easily accessible and convenient especially to students and the non-married. Food vendors are mainly found on the streets and provide benefits such as delivery of a diverse range of low-cost, convenient, and mainly healthy foods, as well as work and income opportunities, particularly for women (Muyanja et al., 2011). Despite the benefits that these food vendors render, they also pose some dangers to the consumers such as consumed foods are generally high in energy and salt which could contribute greatly to gain weight and be exposed to the health dangers of eating too much total refined sugar, salt and fat etc (Labadarios et al., 2011). Another concern for public health is the hygienic aspect of street foods in relation to cooked food preparation, since many nations do not regulate the activities of street food vendors (Hill et al., 2019). A Ugandan study shown that about 70% of food vendors do not have hygiene regulations and operate in poor structures (Muyanja et al., 2011). A study by Chukuezi, (2010) revealed that about 24% of food vendors prepare food under unhygienic conditions, which raises serious public health concerns. A study conducted by Bhowmik & Saha, (2012) reports

that, the majority of fast-food vending operations in rural areas are driven by factors such as unemployment and poverty. In 2016, a study in Nigeria showed that a high (81%) number of food vendors had good level of awareness on food hygiene which is a component of nutrition (Iwu et al., 2017). A study in Nigeria recommended the need to control and monitor food vendor's nutrition knowledge and practice by local authorities (Iwu et al., 2017) . Yet, it is important noting that knowledge does not necessarily translate to practices or attitude. Omemu & Aderoju, (2008) conducted a research in Nigeria, with the findings that, the vendors' expertise could not possibly be converted into reality as a result of lack of elementary amenities such as electricity toilets and among others at their operational places. The rationale of this review is to assess the evidence available, and to inform future research related to nutrition awareness, behaviour and practice of fast-food vendors and how they can be generalized across populations.

The objectives of this review was justified from a conceptual framework developed by (Mensah et al., 2009.). Which identified three main factors that affect the quality of street foods i.e. the Regulatory Dimension, Food Vendor's Dimension and the Consumers Dimension as shown in Figure 2.1.

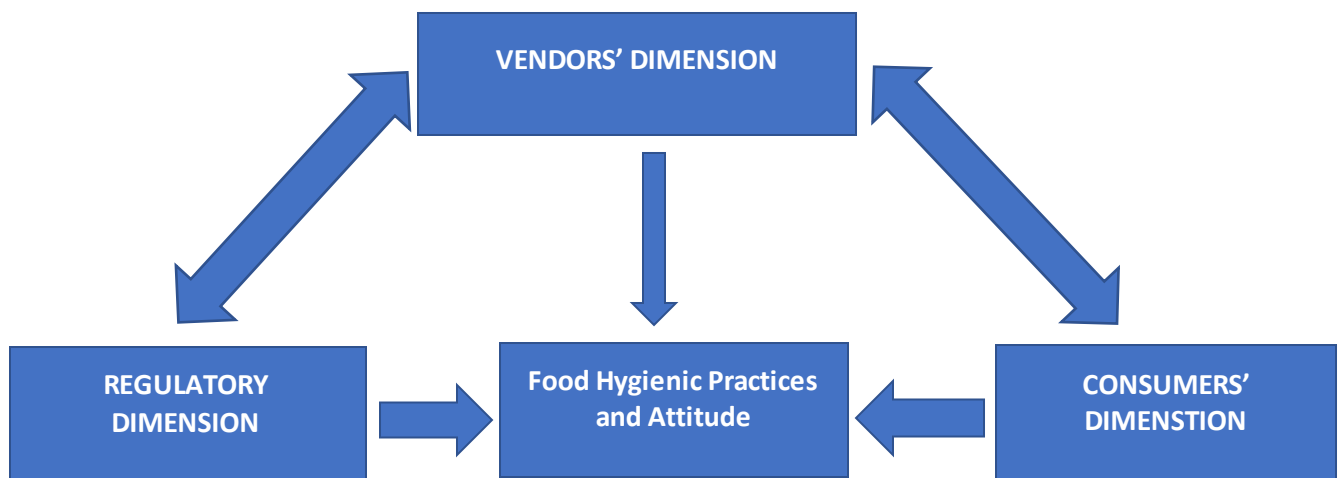


Figure 2.1: Various stakeholders in attitude and hygienic food management practices

2.2 Purpose and Objective of Review

This review sought to find answers to the following questions.

- What is the nutrition knowledge of SFVs reported in the literature from LMICs?
- What is the level of food safety and hygienic practices among SFVs as reported in the literature from LMICs?
- What are the factors that influence food safety and hygienic practices of SFVs as reported in the literature from LMICs?

2.3 Methodology

The framework proposed by Arksey & O'Malley, (2005) was used as a methodological framework for this review. The framework enables researchers to analyse current literature and assess the scale, scope and character of research activity on a specific topic, as well as identify gaps, summarize, and disseminate research findings.

2.3.1 Identifying the Relevant Studies

2.3.2.1 Inclusion criteria

Case-control, cohort and cross-sectional studies that have reported on nutrition knowledge, behaviour and food safety and hygienic practices of SFVs between the years of 2015 -2021 and have been published in peer-reviewed journals were included. Also, studies that have been carried out in LMICs related to this topic were included.

2.3.2.2 Exclusion criteria

Studies which were published in languages other than English were not included. Also excluded from the study were grey literature, editorial pieces, editorial letters, correction letters, articles without a clear methodological approach.

2.3.3 Search Criteria

Three databases (PubMed, Pro Quest and Goggle scholar) were used to identify relevant studies published in English between 2015 and May 2021. Search strings included key words and medical subject headings (MESH) with the help of Boolean operators (OR and AND) to arrive at this (Nutrition OR Nutrients OR Food) AND (Knowledge OR awareness) AND (attitudes OR behavior) AND (practice OR skills) AND (food vendors OR food hawkers OR street food OR food handlers OR fast food) AND (Low-income countries OR Middle-income countries OR Poor income countries OR Developing countries OR South Asia OR Africa OR Asia).

2.3.4 Study selection

Articles from the various data base were exported to a reference manager (i.e., EndNote X8). A multi-stage screening process was applied. Duplicated articles were removed first. In the second stage, titles and abstracts were screened to get rid of articles which were not relevant to the objective of this review. Finally, the remaining articles were subjected to full texts reading and screening to arrive at the final included articles in accordance with the inclusion criteria.

2.3.5 Charting the Data, Summarizing and Reporting the Findings

Articles that matched the criteria for inclusion were categorized under the respective subheadings of the three main research objectives. Issues related to the main research objectives were extracted into excel spreadsheet for further descriptive analysis. The data was

extracted using the Joanna Briggs Institute (JBI) data extraction form or table. Data extracted were:

1. Author(s)
2. Title of study
3. Year of publication
4. Origin/country of origin (where the source was published or conducted)
5. Aims/purpose
6. Sample size
7. Methodology (study design)

2.4 Data analysis and synthesis

Microsoft Excel was used for data chatting after extraction, and was used to perform some descriptive statistics of the various included studies. A narrative synthesis was conducted based on the variables, frequency counts of populations, concepts, characteristics or other fields of data carried out.

2.5 Results

A sum of 371 articles were identified from the three databases (Goggle Scholar, PubMed and ProQuest). A total of 9 duplicates were eliminated. Upon going through the various titles and the abstracts, 331 articles were further eliminated remaining 31 articles. The full text of the remaining 31 titles were retrieved, and 13 were further removed on the basis of not meeting the inclusion criteria thus 18 articles were eligible and included into the scoping review. The Preferred Reporting Items for Systematic and Meta-analysis (PRISMA) flow chart was used to report the selection of studies as shown in Figure 2.2.

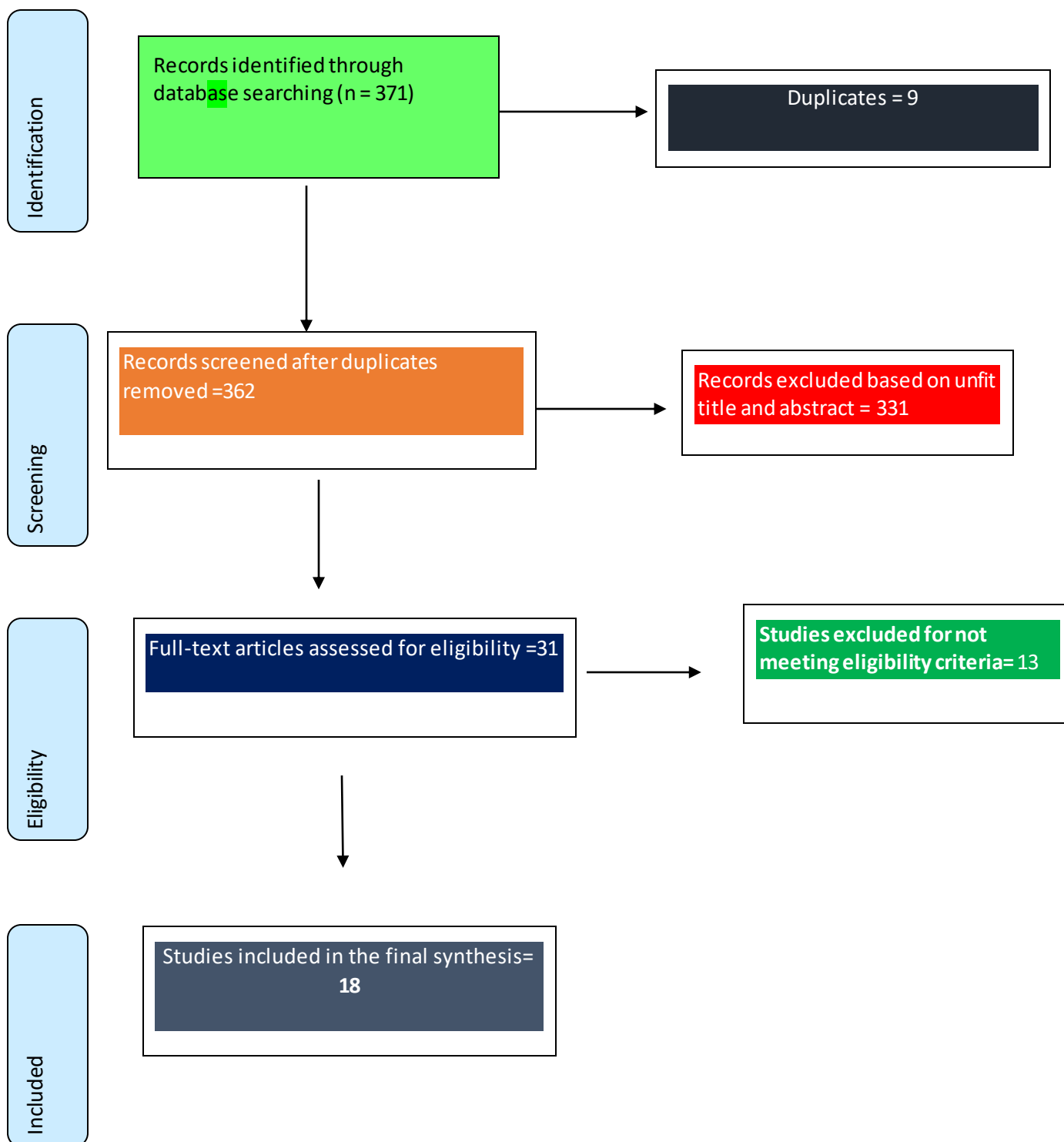


Figure 2.2: Multistep process for study selection and inclusion

2.6 Characteristics of the included studies

Table 2.1 below is a report of all studies included in the analysis. It comprises the authors name, objective of their study, findings, study methodology, year of publication, sample size and country of publication.

Table 2.1: Characteristics of included studies

Author	Title	Year of Publication	Country	Aim of Study	Methodology	Sample size	Key Findings
Iwu et al.	Knowledge, Attitude and Practices of Food Hygiene among Food Vendors in Owerri, Imo State, Nigeria	2017	Nigeria	To assess the knowledge, attitude and hygienic practices of food vendors in Owerri town of Imo State, Nigeria.	Cross-Sectional descriptive design	200	Only 37% of respondents had a good level of hygienic practice, despite the fact that the majority of respondents had a good level of knowledge (81%) and a positive attitude (71%) concerning food hygiene. Food hygiene and environmental health worker inspection training were given to 32 percent and 46 percent of the respondents, respectively. There were also statistically significant associations between knowledge ($p = 0.001$),

							attitude ($p = 0.000$), formal food hygiene training ($p = 0.000$), and the level of food hygiene behaviors ($p = 0.000$).
Samapundo et al	Food safety knowledge, attitudes and practices of street food vendors and consumers in Port-au-Prince, Haiti	2015	Haiti	Determining the food safety knowledge, attitudes and practices of vendors and consumers of street food in Port-au-Prince, Haiti.	A cross-sectional study	240	In general, consumers and vendors exhibited average food safety knowledge and attitude levels. Gender, training, level of education and location did not have a significant effect ($p < 0.05$) on the level of food safety knowledge of the consumers.
Samapundo et al	Food safety knowledge, attitudes and practices of street food vendors and consumers in Ho Chi Minh city, Vietnam.	2016	Vietnam	Evaluating the food safety knowledge, attitudes and practices of consumers and vendors of street foods in Ho Chi Minh City (MCMC), Vietnam.	A cross-sectional study	160	No significant difference ($p > 0.05$) occurred between the food safety knowledge levels of the consumers on the basis of gender. However, significant differences ($p < 0.05$) occurred on the basis of age, education level, food safety training status and location.
Ma et al	Food safety knowledge, attitudes, and	2019	China	To assess food safety knowledge,	Retrospective	100	The results show that street food suppliers have generally poor food

	behavior of street food vendors and consumers in Handan			attitudes, and street food suppliers and consumer behaviors			handling practices, and most are operating under unsanitary conditions.
IsoniAua d et al.	Food Safety Knowledge, Attitudes, and Practices of Brazilian Food Truck Food Handlers	2019	Brazil	To compare the food safety knowledge, attitudes, and self-reported practices (KAP) and observed food safety practices of food truck (FT) food handlers	Cross-sectional, quantitative and exploratory study	40	The results of the survey show significant differences in the attitudes scores regarding marital status ($p = 0.029$), monthly income ($p = 0.018$), and food safety training ($p = 0.033$)
Aluh & Aluh	Knowledge, attitudes and practices of food hygiene among mobile food vendors in a Nigerian rural settlement	2017	Nigeria	To determine the Knowledge, Attitudes and Practice of Food hygiene amongst mobile food vendors in a rural settlement	Cross-sectional descriptive survey	204	Knowledge levels of food safety practices amongst street food vendors in this rural setting was high however, this high knowledge was generally not translated into practice.
Rahman et al.	Food Safety Knowledge, Attitude and Hygiene Practices Among	2016	Sarawak	To assess the level of knowledge, attitude and practice of food	Cross sectional study	361	Age and ethnicity appeared to be relevant factors for food safety knowledge ($p < 0.05$), whereas food safety knowledge and

	the Street Food Vendors in Northern Kuching City, Sarawak			safety among the food vendors in Kuching City, Sarawak and to determine the factors affecting them			training appeared to be influential factors for attitude (p0.05), according to multinomial regression analysis. Food safety knowledge, attitude, training, and age of the food vendors, on the other hand, influence food safety practice, although food selling duration has an inverse association with food safety practice (00.05)
Ahmed et al	Exposure of Food Safety Knowledge and Inadequate Practices among Food Vendors at Rawalpindi	2017	Pakistan	Investigation of food safety knowledge and handling practices among vendors.	Cross-sectional descriptive survey	223	80% vendors agreed that food could be contaminated with the microbes, insects, dust particles, food coloring, and spices used in the preparation of food
Akabanda et al	Food safety knowledge, attitudes and practices of institutional food-handlers	2017	Ghana	The purpose of this study was to evaluate the food safety knowledge, attitudes, and practices among institutional food	Descriptive, cross-sectional survey	235	The institutional food-handlers had satisfactory knowledge in food safety but this does not translate into strict hygienic practices during processing and handling food products.

				handlers in Ghana.			
Hill et al	Food sold by street-food vendors in Cape Town and surrounding areas: a focus on food and nutrition knowledge as well as practices related to food preparation of street-food vendors	2019	South Africa	Assessed food items sold by 831 street-food vendors in Cape Town, their nutrition knowledge and practices related to food preparation.	Cross-sectional study	831	Many of the food items that are sold are unhealthy in terms of portion size, energy-density, and high content of saturated fat, trans fats, salt, and sugar.
Hossen et al	safety knowledge, attitudes and practices of street food vendors in Jashore region,	2020	Bangladesh	To evaluate food safety knowledge, attitude and practice (KAP) of food vendors in Jashore region	Randomized descriptive cross-sectional study	200	Handling food, over 90% vendors did not use any personal protective equipment, 4.5% had diarrhoea, 8.5% did not wash their hands after going to the toilet and 28.5% reused previous leftover oils
Addo-Tham et al.	Knowledge on Food Safety and Food-Handling Practices of	2020	Ghana	The study assessed the knowledge of street food	Cross-sectional mixed approach	340	The study found training of food vendors as the most effective way to increase knowledge on food safety

	Street Food Vendors in Ejisu-Juaben Municipality			vendors on food safety and food handling practices in the Ejisu-Juaben Municipality			and enhance food-handling practices.
Amaami et al	Factors associated with poor food safety compliance among street food vendors in the Techiman Municipality of Ghana	2017	Ghana	This study assessed various factors associated with poor compliance of street food vendors to safety measures in the Techiman Municipality	Cross-sectional study	140	Food vendors in the Techiman Municipality followed poor environmental hygiene practices. The study found that 68% of the vendor sites dirty and 20% were very dirty and with only 12% characterized as clean
Bamidele et al	Hygiene Practices among Workers in Local Eateries of Orolu Community in South Western Nigeria	2015	Nigeria	To determine food hygiene (FH) practices among food handlers in rural communities in South Western Nigeria	Descriptive cross-sectional study	235	Good knowledge and attitude but low level of good practices toward food hygiene characterized food handlers under study
Adane et al	Food hygiene and safety measures among food handlers in	2018	Ethiopia	To assess the status of food hygiene and safety measures	Cross-Sectional Study	135	Service training, medical checkup, wearing a gown during food handling and average monthly income

	street food shops and food establishments of Dessie town, Ethiopia			among street food vendors and food handlers of food establishments of Dessie town			were factors significantly associated with good levels of food hygiene and safety by food handlers.
Nkosi & Tabit	To evaluate the food safety knowledge of street food vendors and the sanitary compliance status of their vending facilities, Zululand District, South Africa.	2021	South Africa	The aim of this study was to check the compliance of street food vendors hygienic practices with requirements of the Codex code of practice	Cross-sectional survey research design	315	Only a minority of the street food vendors had attended high school (47 %) and the vast majority (77 %) of them had not attended any food safety training courses. Overall, the vast majority (76 %) of the street food vendors had low food safety knowledge and only 14 % of the street food vending sites had high compliance with sanitary conditions.
Azanaw et al	Factors associated with food safety practices among food handlers	2019	Ethiopia	To assess factors associated with food safety practices among food handlers	Cross-sectional study	384	Multivariable logistic regression analysis revealed that marital status, food safety training, routine medical checkup, supervision by health professionals and

							knowledge were statistically associated variables with food safety practices.
Kubde et al	Knowledge and food hygiene practices among food handlers in food establishments	2016	India	To procure information about various food handling practices and spread awareness about the prevention of food borne diseases	Cross-sectional study	86	Majority food handlers were not certified in food training (82.5%). It was found that all practices related to food hygiene were very well followed by majority of the food handlers

Regards the year of publication of the included studies, five studies were published in 2017 which was the highest, followed by four for 2019, three for 2016, two each for 2020 and 2015, and one publication each for 2018 and 2021 as shown in figure 2.3.

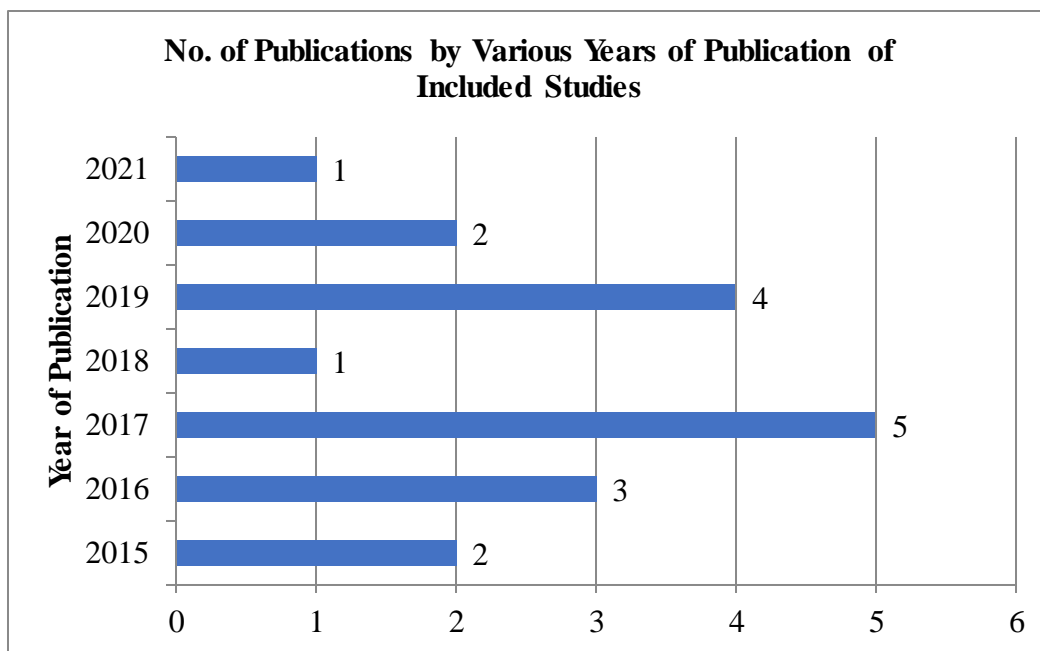


Figure 2.3: Number of articles by various years of publications

The included studies used different research designs. Out of the 18 included studies reviewed, only one used a retrospective design and the rest followed a cross-sectional study as shown in figure 2.4.

Study Methodology

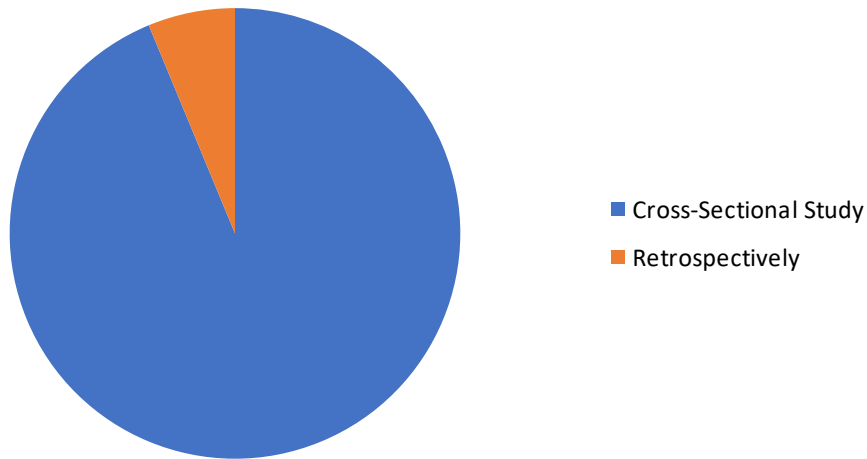


Figure 2.4 Type of Study Design used in included articles

Also, the review looked at the countries and their numbers included in these studies. Ghana had the highest publication of four, Nigeria (three), Ethiopia and South Africa with two each. The rest of the included countries had one publication each as shown in figure 2.5 below.

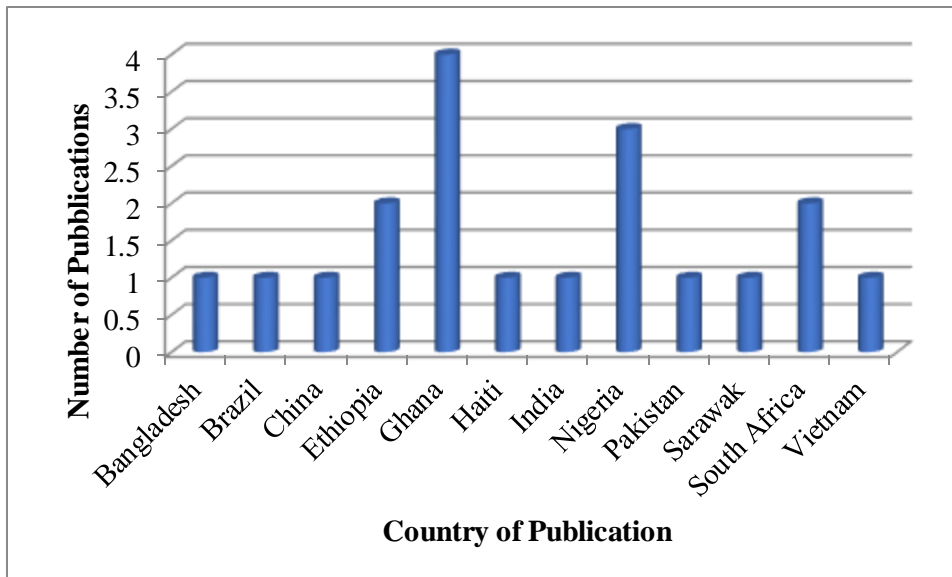


Figure 2.5: Number of articles by various countries of publication

From the 18 articles included in this review, the total sample size was 4339 participants. The minimum sample size was 40 (Auad et al., 2019) and a maximum of 831 (Hill et al., 2019) with a mean value of 263.421 and a standard deviation of 43.810. The included studies comprised of 1466 male participants and 2873 female participants. Only one of the included studies looked at nutrition related knowledge of the participant (Hill et al., 2019). Seven of the included studies reported on the food safety and hygienic practice while ten studies reported on the factors link with food safety and hygienic practice.

2.7 The nutrition knowledge of food vendors reported in the literature from LMICs.

Among the 18 included studies only one study (Hill et al., 2019) investigated the nutrition-related awareness of SFVs. In a cross-sectional study among street food vendors in Cape Town, South Africa, they reported the knowledge scores in three levels namely low, average and high; it was reported in terms of gender and education with most males falling within the high category and about one-third falling within the low category with no schooling history.

2.8 Food safety and hygienic knowledge of SFVs

Twelve of the included studies (Addo-Tham et al., 2020; Ahmed et al., 2017; Akabanda et al., 2017; Akuu et al., 2017; Aluh & Aluh, 2017; Auad et al., 2019; Hossen et al., 2021; Iwu et al., 2017; Ma et al., 2019; Nkosi & Tabit, 2021; Rahman et al., 2017 & Samapundo et al., 2015) reported on food safety and hygienic knowledge of the SFVs. Akabanda et al., (2017) reported a high level of food safety and hygienic knowledge among the fast-food vendors in a study conducted in Ghana were 93.6% of the participants agreed appropriate hand hygiene can avert food borne disease. Again, a study conducted by Hossen et al., (2021), stated a high level of food

safety and hygienic awareness among the food handlers in Bangladesh were 75.5% of the respondents knew that wearing masks is one part of personal hygiene.

2.9 Attitude of SFVs towards food safety and hygienic practices

From the included studies, eight of them (Akabanda et al., 2017; Aluh & Aluh, 2017; Auad et al., 2019; Hossen et al., 2021; Iwu et al., 2017; Ma et al., 2019; Rahman et al., 2016 & Samapundo et al., 2015) reported on the behaviour of SFVs towards food safety and hygienic practices. Almost all the studies revealed a positive attitude of SFVs. Studies by Ma et al., (2019) on food safety knowledge, behaviour and practice of SFVs and consumers in Handan reported that SFVs had good understanding towards food safety and hygienic practice in which 76.7% agreed that the use of hand gloves is a vital attitude to decrease the risk of food contamination and 78% admit that food handlers with injuries on their hands should stay off from handling food without wearing gloves. Similarly, study conducted by Akabanda et al., (2017) in Ghana reported a positive attitude among food handles where 60% of the respondents specified using caps, masks, protective gloves and proper clothing can reduced the dangers of food contamination. However, 86.4% of the respondents did not find it essential to monitor the temperatures of refrigerators and freezers periodically.

2.10 Food safety and hygienic practices SFVs from LMICs

From the review, seven of the included studies (Adane et al., 2018; Addo-Tham et al., 2020; Ahmed et al., 2017; Aluh & Aluh, 2017; Auad et al., 2019; Hossen et al., 2021 & Iwu et al., 2017) reported on food safety and hygienic practice of SFVs. Kubde et al., (2016) in a survey conducted in India, revealed that, most of food handlers are not certified in food handling (82.5 %), although they found majority of food handlers following all food hygiene measures. Ahmed et al., (2017)

opposed the findings of Kubde et al., (2016) and concluded that, most of food sellers exhibited an unprofessional attitude toward food preparation and maintenance as found in their study among food vendors where 61% did not cover their foods. Furthermore, Addo-Tham et al., (2020) in a study among fast food vendors in Ejisu-Juaben municipality finds that, 43.53% of the street food vendors handled food with their bare hands and 73.24% simultaneously serve and collect money. Adane et al., (2018) revealed that about three-quarters (72%) of food handlers in food institutions had a decent level of food hygiene and safety practices in Ethiopia. However, the p-values were not statistically significant and therefore concluded in their study that evidence on the level of food hygiene practices and food safety measures among food handlers is required for proper planning. The results of Ma et al., (2019) conducted in China on food safety knowledge, behaviour of SFVs and consumers in Handan showed majority of fast food vendors had insufficient food handling standards and work in unhygienic settings.

Finally, according to Akuu et al., (2017), environments on which hygiene practice of SFVs in the Techiman Municipality operates is poor. Their findings again revealed 68% of the vendor sites were dirty and 20% were very dirty and with only 12% characterized as clean.

2.11 Factors associated with food safety and hygienic practices of SFVs in LMICs.

Ten of the included studies (Adane et al., 2018; Addo-Tham et al., 2020; Akabanda et al., 2017; Akuu et al., 2017; Auad et al., 2019; Azanaw et al., 2019; Bamidele et al., 2015; Hossen et al., 2021; Rahman et al., 2016 & Samapundo et al., 2015) reported factors associated with food safety and hygienic practices of SFVs.

According to Rahman et al., (2016), the food safety and hygienic practice was influenced by food safety awareness, behaviour, training, and the age of the food vendors, however the duration of food vending had an inverse association with the food safety practice.

Hossen et al., (2021) in Brazil revealed that, only degree of education ($p = 0.005$ and 0.015) had a significant impact on the vending machine's food safety awareness and practice. According to Akuu et al., (2017), knowledge of food hygiene practices was 91.4% and depended on vendor's educational level. According to Auad et al., (2019) respondents with employees, higher monthly incomes, and training had significantly higher food safety and hygienic practice. Samapundo et al., (2015) revealed that gender, level of education and place of vending did not have a significant effect ($p < 0.05$) on the level of food safety and hygienic practice of food vendors. Azanaw et al., (2019) in their study revealed that marital status was a significant factor associated with food safety and hygienic practice among SFVs from Ethiopia.

Again, three of the included studies (Adane et al., 2018; Azanaw et al., 2019 & Samapundo et al., 2015) reported an association between personal factors and food safety and hygienic practice of SFVs. According to Adane et al., (2018) food handlers' food hygiene and safety practices were significantly associated with facility training, medical check-ups, wearing a gown when handling food, and average monthly salary. Azanaw et al., (2019) in their study reported that food safety training, routine medical check-up, regulation by health authorities and knowledge were statistically associated with food safety and hygienic practices.

However, Samapundo et al., (2015) reported that consumers and food sellers had average knowledge and attitudes about food safety and the level of training had no significant association with food safety practice.

Also, Addo-Tham et al., (2020) & Iwu et al., (2017) reported similar factors associated with food safety and hygienic practice of SFVs. Iwu et al., (2017) evaluated the knowledge, behaviour and the level of practice of food hygiene among SFVs in Owerri town of Imo State in Nigeria and discovered that knowledge, behaviour and training were significantly associated with the level of food hygienic practices among SFVs. Addo-Tham et al., (2020) revealed that food safety and hygienic practice was associated with knowledge on food safety practices, training ($p \leq 0.011$) and license status ($p \leq 0.002$).

2.12 Conclusion on scoping review

From the literature reviewed, it was observed that all the included studies were on food safety awareness, behavior and practices of food vendors except the study conducted by Hill et al., (2019) that reported on nutrition knowledge as well as practices related to food preparation among SFVs. Almost all of the included studies were done using cross-sectional study. All the 18 articles revealed that there were more women participants compared to men. With minimum sample size of 40 and maximum of 831, most of food handlers were not certified in food training, according to the literature. Food safety and hygiene practices of SFVs were significantly associated with medical checkups, wearing a gown while handling food, age, service training, education level, food safety training status, place, marital status, and average monthly income. Knowledge and attitude, were important determinants of food safety and hygienic practices.

Knowledge is necessary to effectively prepare and sell nutritious and safe food to the public. From the literature reviewed, the findings demonstrate that research into the food safety and hygienic knowledge of SFVs is common. The findings generally show that SFVs have adequate knowledge in food safety and hygienic practices. However, there was a scarcity of data on nutrition knowledge of SFVs. To fill this knowledge gap, it is imperative for this study to be conducted.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This part of the study comprises the methods used to conduct the study. It consists of the study area, study design, sample population and size, sampling techniques, data collection tools, data quality control issues, study variables and ethical concerns.

3.1 Study Setting/area

The study was carried out among SFVs within the Tamale Metropolis of the Northern Region of Ghana. Tamale is part of the six Metropolitan Assemblies in the country and the only Metropolis in the northern part of the country. Tamale also doubles as the capital of the Metropolis and the regional capital. The Metropolis has an estimated land area of 454km² and is situated in the middle of the region with Sagnarigu Municipality to the West and North, Mion District to the East, East Gonja to the South and Central Gonja to the South-West (Ghana Statistical Service, 2021).

The strategic location of the Metropolis within the region offers it with a viable market for economic activities. This draws people from within and outside the region, including traders from some of the neighbouring Sub-Saharan African countries. Being the biggest city in the north also makes the Metropolis a major destination of rural urban migrants. These result in a cosmopolitan state with diverse group of ethnicities including Dagombas (majority), Mamprusis, Akan, Dagaabas, Gonjas, Frafra, Kusasis as well as Kasenas from the Upper East Region (Ghana Statistical Service, 2021).

The 2021 Population and Housing Census (PHC) puts the population of the Metropolis at 374,744 with 185,051 (49.4%) males and 189,693 (50.6%) females (Ghana Statistical Service, 2021). The Metropolis resides in urban setting. Food vendors activities is one of the most popular occupation within the metropolis. Both stationary and mobiles vendors are noted among majority of women at vantage points in the metropolis (Figure 3.1) shows the map of the metropolis.

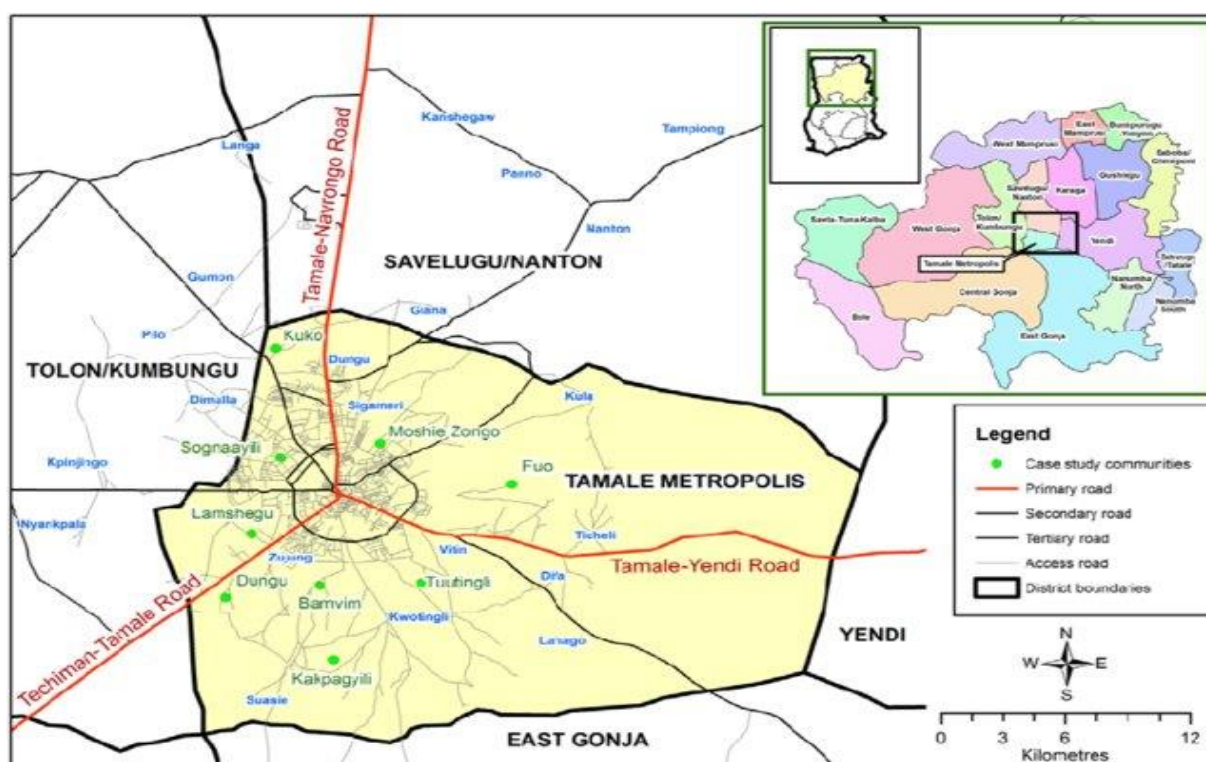


Figure 3.1: Map of Tamale Metropolis

3.2 Study Design

An analytical cross-sectional research design was used in this study. A cross-sectional study is a one-time study design that allows all variables to be determined simultaneously (Levin, 2006). The cross-sectional design was chosen for this research because it will make it possible to measure

both dependent and independent variables at the same time. Since this study is time bound, a design of this nature will allow the researcher to measure the study variables concurrently without delay.

3.3 Study population/participants

The research was limited to street food vendors in the Tamale Metropolis, more specifically the central business district of the metropolis, University for Development Studies, Tamale campus and its environs, Lamashegu, and the Tamale Teaching Hospital and its environs. Both stationary and mobile street food vendors constituted the sample frame. The entire target group was focused on the study's goal of determining the hygienic practices of SFVs.

3.4 Inclusion and exclusion criteria

The study recruited food vendors at vantage points within Tamale metropolis. People who sell foods that are ready cooked and usually sold in the streets and places with less than four walls are considered to be SFVs (Gelormini et al, 2015). Food vendors on the streets, bus stops, hawkers, private and government premises (school, hospital, etc.) was included in the study. However, hotels, restaurants, food manufacturing industries were exempted from the study.

3.5 Sample Size Determination

The sample size is calculated using the Hawkins, (1989) formula for a point estimate sample;

$$N = \frac{z^2 p(1-p)}{M.E^2} \text{ (Hawkins, 1989) where } N \text{ is the sample size; } z^2 \text{ Is the abscissa of the normal curve}$$

that cut-off an area at the tail (1-equals the desired confidence level, 95%) which is the critical value of 1.96; P is the estimated proportion of nutrition knowledge, attitude and practice by food vendors from similar study with a standard prevalence of 50%; M.E is the desired level of precision (5%=0.05)

$$n_0 = \frac{(1.96)^2 \times 0.50 \times 0.50}{0.05^2}$$

$$n_0 = 0.9604/0.025$$

$$n_0 = 384.16$$

Thus, the calculated sample size is approximately 385. Using 10% as non-response rate, the sample size for this study would be 424 SFVs. The sample size for this study was 424.

3.6 Sampling and sampling techniques

The non-probability sampling technique was used in this study, with a focus on the purposive sampling technique. Food vendors at vantage points such as roadside, bus stops, private and government premises (school, hospital, e.t.c) were approached and recruited into this study.

3.7 Study variables

Socio demographic characteristics such as education, income, marital status, age, religion and ethnicity were considered as independent variables as well as operational characteristics of the food vendors such as number of days work per work, whether their vending was stationary or mobile, and number of persons employed. Also, nutrition knowledge, food safety knowledge as well as attitude of SFVs towards food safety and hygienic practice was included in the independent variable. Food safety and hygienic practice was considered the dependent variable.

3.8 Data Collection Procedures

Permission was sought from the Tamale Metropolitan Health Directorate and the Metropolitan Assembly to begin data collection. Due to the overpopulation and high number of SFVs in the metropolis, it was stratified into three zones. Street food vendors in each zone who met the inclusion criteria were contacted at their various vending points. Data was collected using an

online questionnaire designed using KoboCollect software application. Three University graduates were trained as research assistants (RAs) for the purposes of data collection. The RAs were frequently supervised and monitored by the lead author. The food vendors were approached by RAs, who introduced the study to them. Those who consented to participate were taken through the informed consent procedures and those who consented to participate were administered the questionnaire. For minors, a guardian was made to stand in for them in the consent process. Questions were read directly to those who understood the English language and for those who could not speak and/or write in the English Language had the items translated into a local dialect i.e., Dagbanli for them. No respondent was forced to participate in the study. Personal identification data were excluded so as to maintain confidentiality of respondents' information. Verbal and written informed consent were sought for before respondents participated in the study. Respondents were assured that they were at liberty to draw out from the study at any point if they felt uncomfortable.

Ethical approval was obtained from the Committee on Human Research and Publication and Ethics (EHPE) of the Kwame Nkrumah University of Science and Technology (KNUST), (CHRPE/AP/191/21).

3.9 Data collection methods

Data were obtained using a KoboCollect software application for a period of eight (8) weeks. The questionnaire was put into phases/section. The first phase evaluated the socio-demographic characteristics of the respondents (such as age, sex, level of education, religion, marital status and Training on food safety). The second phase assessed the operational characteristics of the food vendors. The third phase examined the nutritional knowledge of the SFVs and the fourth phase assessed the food safety knowledge of the respondents. The fifth phase assessed the attitude of the

SFVs towards food safety. The sixth phase employed a checklist that was used to observe the food safety and hygienic practices of the SFVs. Each outlet that was observed had one or more food vendors operating in it. The items of the questionnaire were created by reviewing relevant literature, including existing questionnaires that have been used in previous studies. (Addo-Tham et al., 2020; Akabanda et al., 2017 & Hill et al., 2019)

There were 11 items to assess the respondent's knowledge on nutrition using multiple choice questions of choose the most appropriate answer format. A correct answer was scored one mark and a zero mark was given for a wrong answer. The total nutrition knowledge scores were obtained by summing up the marks gained for each item. Mean \pm SD score of nutrition knowledge was then computed.

A total of 14 items were encompassed to assess the respondent's food safety knowledge. Response to each item was "yes or no". One mark was given for correct answer and zero mark was given for wrong response. The mean \pm SD food safety knowledge score was then computed.

A total of 12 items were encompassed to assess the respondent's attitude towards food safety and hygienic practice. Each item was assessed using a 5-point Likert scale i.e., 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree. Strongly agree and agree were combined to constitute agree and strongly disagree and disagree combined to constitute disagree. The mean \pm SD score attitude of SFVs towards food safety and hygienic practice was then computed.

A 22-item was used to assess respondent's food safety and hygienic practices. Participants were observed to see if they practiced food safety and hygienic practice. Those who followed any of the items identified in the checklist was scored one and those who did not were scored zero. The mean \pm SD score of food safety and hygienic practice of the SFVs were then computed.

3.11 Data analysis and presentation of results

The Statistical Package for the Social Science (SPSS) version 20 was used to conduct data analysis. Descriptive statistics such as frequencies, percentages, means, standard deviations, pie charts and graphs were used to describe the data. Independent student t test and one-way ANOVA were used to test for means difference between categorical and continuous variables. Correlation was used to test for linear relationship among continuous variables. A linear regression model was developed to determine the association between independent factors and the dependent variable (i.e., food safety and hygienic practice) since the dependent variable was continuous and most of the independent variables. A p-value of less 0.05 at 95% confidence interval was considered significant.

3.12 Quality control issues

Appropriate training of the three RAs was the primary measure that was taken to safeguard the quality of data. They were trained on how to effectively take data using the KoboCollect software application. To ensure easy comprehension and understanding of the items, a pre-test study was conducted in the University for Development Studies, Tamale campus canteen within the study area to test the data collection instruments before rolling up to scale. This was necessary because the study participants were similar. The KoboCollect software application with the questions were also sent to other colleagues as well as the research supervisor to appraise for the appropriateness of the questions in collecting information on the respondents.

CHAPTER FOUR

RESULTS OF THE STUDY

4.0 Introduction

Results from the analysed data are presented in this chapter. Four hundred and twenty-four questionnaires were distributed to food vendors in the Tamale Metropolis and all were filled out entirely and accurately, with a 100% response rate. The analyses of the collected data are presented next.

4.1 Socio-Demographic and general characteristics of the Respondents

Out of the 424 food vendors, 83.5% were females and 16.5% were males as shown in Table 4.1 which also summarizes the age characteristics of the 424 respondents (street food vendors). Food vendors ages ranged from 10-20years to above 50 years (mean = 33.10 ± 9.06 years with a minimum age of 10 years and a maximum age of 60 years), with majority of the respondents between 31 and 40 years of age. Regarding the educational status of respondents, 51.1% had basic education, 17.9% had secondary education, 2.4% had tertiary education, with the remaining 28.5% of the respondents having no formal education. Food vendors education level showed 28.4% had attained high school, university, or postgraduate level education.

Majority (57.1%) of the respondents have not received training on nutrition, 52.8% had no training on food safety and only 47.2% received training on food safety.

Table 4.1: Socio-Demographic and general characteristics of the respondents

Variable	Frequency	Percent (%)
Sex		
Female	354	83.5
Male	70	16.5
Total	424	100
Age Range		
10-20	43	10.1
21-30	126	29.7
31-40	164	38.7
41-50	81	19.1
50 and above	10	2.4
Total	424	100
Level of Education		
Primary	85	20
JHS	132	31.1
SSS/SHS	76	17.9
Tertiary	10	2.4
None	121	28.5
Total	424	100
Have you received training on nutrition		
Response		

No	242	57.1
Yes	182	42.9
Total	424	100

Have you received training on food safety

No	224	52.8
Yes	200	47.2
Total	424	100

4.2: Operational Characteristics

4.2.1: Food normally sold by SFVs

On the type of food sold, the study revealed that food vendors on various authorized food selling points in the metropolis sold banku (8.3%), fried rice (9%) kenkey (9.4%), waakye (23%) and rice and stew (43%). However, about 7.3% of the respondents indicated others which comprised fufu, rice balls, fried yam, jollof, indomie, beans, touzafi etc. This presented in Figure 4.1.

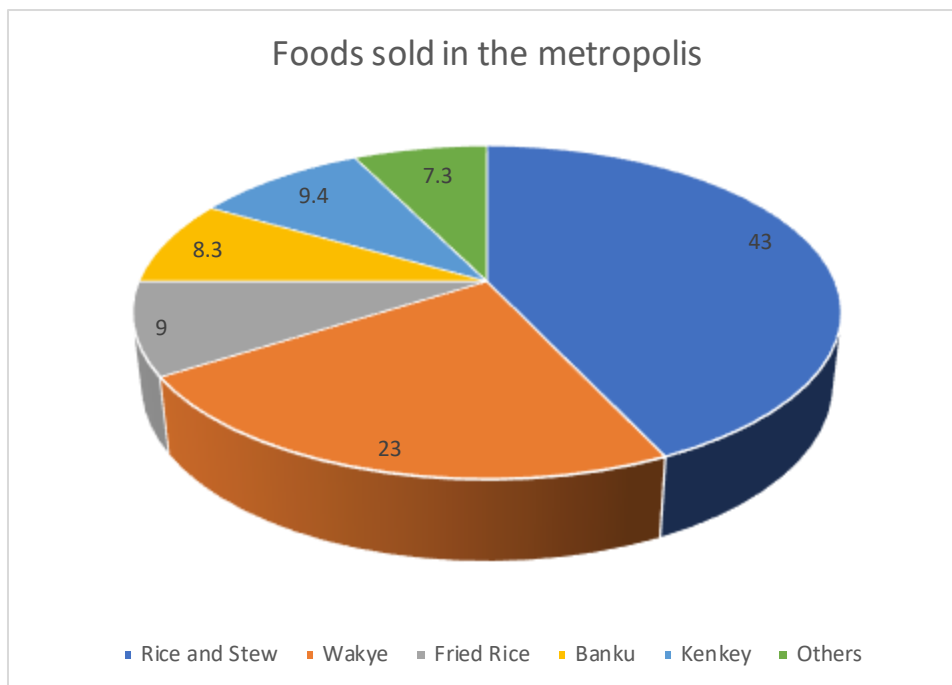


Figure 4.1: Food normally sold by food vendors

4.2.2 Operational Characteristics of street food vendors

Respondents were assessed on the possession of business certificate and whether they do medical check-up before the commencement of their business. As shown in Table 4.2, the majority (87.7%) of SFVs in the study area do not have business certificate. Similarly, 77.6% of the respondents do not undertake any form of medical check-up before the commencement of the food vending business.

Table 4.2: Operational Characteristics of street food vendors

Do you have a business certificate		
Response	Frequency	Percent (%)
NO	372	87.7
YES	52	12.3

Total	424	100
-------	-----	-----

Medical check-up before commencing the food vending business

Response	Frequency	Percent (%)
NO	329	77.6
YES	95	22.4
Total	424	100

Business ownership

Response	Frequency	Percent (%)
Joint owner	73	17.2
Non owner	77	18.2
Owner	274	64.6
Total	424	100

Where is the food cooked

Response	Frequency	Percent (%)
Home	216	50.9
On-site	208	49.1
Total	424	100

What happens to leftover food

Response	Frequency	Percent (%)
Thrown away	0	0
Taken home to eat	201	47.4
Given away	153	36.1
Sold the next day	70	16.5

Total

424

100

4.3 Nutrition knowledge of the Respondents

Respondents' nutritional knowledge was assessed based on questions from that section of the questionnaire and the findings presented in Table 4.3. Greater than half of the respondents (68.6 %) knew foods that help fight disease and builds immunity, knew that excessive intake of salt could cause diseases (80.0%) and that consumption of fruits and vegetables daily is good for a healthy heart (81.1 %). Most food vendors (88.1 %) knew that the carbohydrate nutrient provides the body with energy. The Mean \pm SD score of nutrition knowledge was 7.08 ± 1.75 with minimum score of 1.0 and maximum score of 11.

Table 4.3: Nutrition knowledge of the respondents

Nutrition knowledge aspect tested	Frequency	correct answers
Foods that help fight disease and builds immunity	291	68.6
What nutrient is provided by energy given foods?	320	75.5
Foods that helps to build the body?	94	22.2
Foods that provides the body with blood?	400	94.3
food that is good for a healthy heart	344	81.1
Foods that do not have added sugar?	307	72.4
A balanced diet consists of	206	48.6
Diseases could be caused by excessive intake of salt?	339	80
Prolonged cooking of foods such as vegetables can lead to	317	74.8

The following are some of the ways to preserve nutrient

value of food except	59	13.9
Nutrient loss can be alleviated through	323	76.2

4.5 Food safety knowledge

Table 4.4 illustrate food safety knowledge of SFVs in the Tamale Metropolis. On importance of cooking food, 60.6% of the SFVs had knowledge about the importance of cooking food. The study further revealed that 69.6% of the respondents knew cooking food aids food to digest easily; 57.1% believes cooking add variety to food and 59% of the respondents also cooking of food adds flavour to the food. Majority of the respondents stated that cooking makes food safe for consumption, however 55.9% of the respondents disagreed that cooking adds all nutrients to food.

Food vendors were assessed on ways by which food can be contaminated in which 87.3% of the respondents said poor personal hygiene could lead to food contamination and 64.9% stated time-temperature abuse can lead to food contamination. Also, 73.3% of the respondents thinks poor sale can lead food contamination. The mean \pm SD food safety knowledge score was 9.08 ± 3.14 with a minimum score of 2 point and maximum score of 14 points.

Table 4.4: Food safety knowledge

Practices	Variable	Category	Frequency (%) n=424
Cooking food helps in the following			
	Digest food easily	Yes	295 (69.6)
		No	129 (30.4)

Adding variety to food	Yes	242 (57.1)
	No	182 (42.9)
Adding flavours to food	Yes	250 (59.0)
	No	174 (41.0)
Making food safe for consumption	Yes	310 (73.1)
	No	114 (26.9)
Adding all nutrients	Yes	187 (44.1)
	No	237 (55.9)

Ways by which food can be contaminated

Poor personal hygiene	Yes	370 (87.3)
	No	54 (12.7)
Cross contamination	Yes	292 (68.9)
	No	132 (31.1)
Time temperature abuse	Yes	275 (64.9)
	No	149 (35.1)
Poor sales	Yes	311 (73.3)
	No	113 (26.7)

Food handlers can contaminate food by doing the following

Have open wounds	Yes	297 (70.0)
	No	127 (30.0)
Having unkempt hair	Yes	205 (48.3)
	No	219 (51.7)
Not covering the hair	Yes	202 (47.6)

	No	222 (52.4)
Regular hand washing	Yes	150 (35.4)
	No	274 (64.6)
Use of aprons	Yes	134 (31.6)
	No	290 (68.4)

4.6: Food safety and hygienic practice

The results of the study on food safety and hygienic practice are presented in Tables 4.5. On inspection of hazards that may lead to food contamination, the study results shows that majority of the respondents handle money and food simultaneously (78.8%) while about half of the respondents had jewellery on hand while serving food (46.7%). On additional inspection of the hazards, it was detected that about half of the respondents showed flu-like symptoms (48.8%). On inspection of personal protective clothing of the respondents, most of the respondents neatly had their hair covered (61.3%) but only about half of the respondents use half apron while preparing food (51.7%), with only 37.7% of the respondents using full apron. Greater than half of the respondents did not use hand gloves while preparing and serving food. On further inspection of food safety and hygiene practices with regard to hand hygiene, majority of the respondents do not keep clean and short nails (88.9%). Majority of respondents had hands free of sores (90.3%), with no rings on the fingers (55.7%). The mean \pm SD food safety and hygienic practice score was 7.06 \pm 2.66 with a minimum score of 2 point and maximum score of 14 points

Table 4.5: Food safety and hygiene practice (checklist)

Practices	Variable	Category	Frequency (%) n=424
Hazards that may lead to food contamination			
	Jewellery on hand while serving	Yes	198 (46.7)
		No	226 (53.3)
	Handling money and food simultaneously	Yes	334 (78.8)
		No	90 (21.2)
	Flulike symptoms	Yes	207 (48.8)
		No	217 (51.2)
	Smokes in between serving food	Yes	1 (0.2)
		No	423 (99.8)
Protective clothing			
	Full apron	Yes	160 (37.7)
		No	264 (62.3)
	Half apron	Yes	219 (51.7)
		No	205 (48.3)
	Hair covering	Yes	260 (61.3)
		No	164 (38.7)
	Plastic gloves	Yes	181 (42.7)
		No	243 (57.3)
Hands hygiene			
	Clean and short nails	Yes	47 (11.1)

	No	377 (88.9)
Hands free of sores	Yes	383 (90.3)
	No	41 (9.7)
No rings on the fingers	Yes	236 (55.7)
	No	188 (44.3)

Food handling

Separate utensils for cooked and raw food	Yes	356 (84.0)
	No	68 (16.0)
Adequate takeaway containers	Yes	349 (82.3)
	No	75 (17.7)
Adequate cutlery	Yes	217 (51.2)
	No	207 (48.8)
Cooked food kept covered	Yes	395 (93.2)
	No	29 (6.8)

Method of hand- and dishwashing and surface cleaning

Basin/bottled water	Yes	302 (71.2)
	No	122 (28.8)
Soap	Yes	389 (91.7)
	No	35 (8.3)
Antiseptic	Yes	89 (21.0)
	No	335 (79.0)

Cloth to dry hands	Yes	201 (47.4)
	No	223 (52.6)
Clean dry sponge/cloth	Yes	216 (50.9)
	No	208 (49.1)

4.7: Attitudes of SFVs toward food safety and hygienic practice

In Table 4.6, 80.4% of the respondents agreed that indeed they understood that good individual hygiene prevents food borne infection. However, 11.6% disagreed that food borne illness can be prevented through good personal hygiene while 8.0% respondents indicated that they do not know good personal hygiene as a food safety attitude. Similarly, 82.1% respondents agreed contamination of food can be as a result of poor personal hygiene. However, 10.6% of the respondents disagreed that poor personal hygiene could lead to contamination of food while 7.3% respondents indicated that they do not know poor personal hygiene can lead to contamination of food. The mean \pm SD attitude of SFVs towards food safety and hygienic practice was 49.00 ± 9.60 with a minimum score of 12 point and maximum score of 60 points.

Table 4.6: Attitudes of street food vendors towards food safety and hygienic practice

STATEMENT	Disagree	Neutral	Agree
Producing safe food is more important than tasty food	42(9.9)	17 (4.0)	365 (86.1)
Well cooked food is free from contamination	37(8.8)	26 (6.1)	361(85.1)
Raw and cooked food should be stored separately to reduce the risk of contamination	37(6.8)	53 (12.5)	342(80.7)
Food should not be touched with wounded hands	20(4.7)	15 (3.5)	389 (91.7)

Reuse of oil is harmful for health	90(21.2)	137 (32.3)	197 (46.4)
Good personal hygiene can prevent foodborne illness	49(11.6)	34 (8.0)	341 (80.4)
Unsafe food can result in illness	53(12.5)	64 (15.1)	307(72.4)
Washing hands before handling food reduces risk of food poisoning	40(9.5)	43 (10.1)	341 (80.5)
Safe food handling is an important part of your job responsibility	59(13.8)	37 (8.7)	351 (82.8)
Poor personal hygiene can lead to contamination of food	45 (10.6)	31 (7.3)	348(82.1)
Over cooking food can lead to loss of nutrient	23 (5.5)	25 (5.9)	376(88.5)
Diet diversity is a key indicator of nutrition quality	81 (19.1)	91 (21.5)	252 (59.4)

4.8 Univariate analysis of factors associated with food safety and hygienic practice scores

Mean practice scores of the participants were stratified by general and demographic characteristics of the participants and presented in Table 4.7. There was significant difference ($p < 0.001$) in the mean (SD) practice scores for vendors who had high level of education, 11.6(2.17) and those with no formal education or low level of education, 10.26(2.86). Male vendors had higher mean practice scores of 12.26(2.09) compared to their female counterparts, 11.41(2.79). Mobile vendors of 12.77(2.26) was significantly ($p < 0.001$) higher on food hygiene and safety practice scores than stationary food vendors, 11.36(2.68). Food vendors who cooked at home, 11.2(2.62) had lower ($p = 0.002$) food hygiene and safety practice scores compared to those food vendors who cooked at the point of sale, 12.02(2.64). Furthermore, participants who reportedly had ever received training on food hygiene and food safety had higher practice scores than those who had never received any training.

Table 4.7: Mean (SD) food safety and hygienic practice score stratified by general and socio-demographic characteristics

Variable	N	Mean(SD)	95% CI		p-value
Education					
None	122	10.29(2.86)	9.77	10.8	0.001
Low Education	216	11.76(2.36)	11.44	12.07	
High Education	86	11.61(2.17)	12.64	13.57	
What Happens to leftover food					
Given away	104	12.2(2.43)	11.84	12.79	0.018
Sold the next day	114	11.37(2.85)	10.84	11.9	
Taken home to eat	167	11.34(2.66)	10.93	11.74	
Throw away	39	11.59(2.44)	10.8	12.38	
Who is the owner					
Joint Owner	73	11.59(2.41)	11.03	12.15	0.744
Non owner	77	11.82(2.74)	11.2	12.44	
Owner	274	11.55(2.71)	11.23	11.88	

Who cook the food					
Employee	65	12.05(2.53)	11.42	12.67	0.136
Mix	129	11.47(2.66)	11	11.93	
Self	219	11.49(2.73)	11.13	11.86	
Spouse	11	13(1.18)	12.21	13.79	

Sex					
Male	70	12.61(2.09)			
Female	354	11.41(2.72)			0.001

Mobile	75	12.77(2.26)			
Stationary	349	11.36(2.68)			< 0.01

Medical check					
No		11.66(2.6)			
Yes		11.43(2.88)			0.489

Where is food cook					
Home	216	11.2(2.62)			
Site	208	12.02(2.64)			0.002

Marital Status					
Single	174	11.89(2.64)			
Married	250	11.42(2.67)			0.469

Business			
Certificate			
No	372	11.35(2.63)	
Yes	52	13.42(2.15)	< 0.01

Nutrition			
training			
No	242	11.75(2.47)	
Yes	182	11.42(2.89)	0.214

Safety training			
No	224	11.24(2.67)	
Yes	200	12.02(2.6)	0.002

4.9 Correlation analysis among continuous variables and food hygiene and safety practice scores

A weak significant negative correlation ($r = -0.100$, $p = 0.04$) was observed between food safety practices and the number of days food vendors worked per week. Also, a negative correlation ($r = -0.116$) was observed between the food vendor's age and food safety practice. In addition, there was a significant ($p < 0.001$) positive correlation between food safety practice with food safety attitude (0.422), food safety knowledge ($r = 0.372$) and nutrition knowledge (0.171).

Table 4.8: Correlation analysis among related factors and food safety and hygienic practice score of food vendors

Variable	Age	Dw/W	Hw/D	FSP	FSK	FSA	NK	WE
Age	1.000							
Dw/W	-0.045	1.000						
Hw/D	0.197**	0.135**	1.000					
FSP	-0.236**	-0.100*	0.064	1.000				
FSK	0.116*	0.192**	-0.083	0.372**	1.000			
FSA	-0.095	-0.242**	-0.172**	0.422**	0.660**	1.000		
NK	-0.102*	0.111*	-0.163**	0.171**	0.529**	0.329**	1.000	
WE	0.363**	0.033	0.206**	-0.060	-0.029	-0.116*	0.165**	1.000

Dw/W = Days worked per week, Hw/D= Hour’s work per day, FSK = Food safety knowledge, FSA = Food safety attitude, FSP = Food safety practice, NK= Nutrition Knowledge WE = Workers employed. *Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed).

4.10 Multiple linear regression analysis of factors associated with food safety and hygienic practice scores

A multiple linear regression was run to determine factors associated with food safety and hygienic practice scores from the various independent variables and the results presented in Table 4.9. For categorical variables, dummy codes were used in the regression model. Some of these variables were significantly associated with food safety and hygienic practice scores. The independent variables explained 31.4% of the variability of the dependent variable. The constant is the conditional mean when all predictors’ variables are zero. A negative relationship was showed between participant’s education level and food safety and hygienic practice score ($p < 0.001$). Participants with no education scored 2.1 points lower compared to their other

counterparts with high education with respect to food safety and hygienic practice score. Moreover, a positive relationship was observed between mode of operating their business and food safety and hygienic practice score. Stationary vendors scored 0.91 points higher compared to their other group who were mobile. Also a negative correlation was noted between vendors who had a business certificate and food safety and hygienic practice score. Vendors without a business certificate scored 1.21 points lower compared to those with business certificate with regards to the practice of food safety and hygienic score.

Table 4.9: Multiple linear regression analysis of factors associated with food safety and hygienic practice scores

Variable	B	95% CI	Beta	T	p-value
(Constant)	9.84	6.73-13.0		6.23	< 0.001
Sex					
Male	0.55	-0.10 - 1.20	0.08	1.67	0.095
Age	-0.03	-0.06 - 0.00	-0.10	-1.88	0.061
Marital Status					
Single	0.04	-0.46 - 0.54	0.01	0.15	0.883
No. of workers employed	0.07	-0.02 - 0.17	0.08	1.50	0.135
No. of days worked per week	-0.12	-0.35 - 0.10	-0.05	-1.06	0.291
No. of hours of work	0.13	0.05 - 0.20	0.15	3.14	0.002
Food hygiene and safety knowledge score	0.18	0.07 - 0.29	0.21	3.20	0.002
Nutrition knowledge score	-0.07	-0.22 - 0.08	-0.04	-0.89	0.377

Attitude score	0.04	0.01 - 0.07	0.14	2.74	0.006
Level of Education					
None	-2.10	-2.84 - -1.36	-0.36	-5.57	<0.001
Low	-0.82	-1.45 - -0.20	-0.15	-2.59	0.010
Stationary/ Mobile					
Stationary	0.91	0.31 - 1.50	0.13	2.98	0.003
Safety Training					
Has not received food safety training	-0.05	-0.56 - 0.45	-0.01	-0.18	0.855
Nutrition Training					
Has not received nutrition training	-0.10	-0.66 - 0.46	-0.02	-0.36	0.721
Business Certificate					
Has no business certificate	-1.21	-2.03 - -0.39	-0.15	-2.89	0.004
Has undergone medical check					
No	0.68	0.07 - 1.29	0.11	2.19	0.029
Business owner					
Owner	0.05	-0.59 - 0.69	0.01	0.15	0.885
Joint Owner	0.17	-0.64 - 0.97	0.02	0.41	0.884
Place of cooking food					
Home	-0.59	-1.04 - 0.14	-0.11	-2.58	0.010
Who cooks the food					
Self	0.38	-1.12 - 1.87	0.07	0.50	0.620

Mix	0.60	-0.94 - 2.15	0.11	0.77	0.442
Employee	-0.01	-1.52 - 1.50	-0.00	-0.01	0.992
What happen to leftover					
Given Away	0.59	-0.33 - 1.51	0.10	1.27	0.205
Sold the next day	0.48	0.46 - 1.43	0.08	1.00	0.317
Taken Home	0.29	-0.58 - 1.16	0.05	0.65	0.514

$F(25, 398) = 8.75, p < .0005, R^2 = 0.314.$

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This research was done using a sample of 424 food vendors in the Tamale Metropolis to examine the nutrition knowledge, attitudes towards nutrition, as well as food safety and food hygienic practices of SFVs in the Tamale Metropolis of the Northern Region of Ghana. This chapter draws a relation between the existing literature and the findings of this study.

5.1 Socio-demographic and general characteristics of the Respondents

Four hundred and twenty-four questionnaires were disseminated with each SFV per questionnaire and all were complete (response rate = 100%).

The study revealed that, 83.5% of the food vendors were females. This is in congruence with the results of similar studies in other nations like Nigeria (Omemu & Aderoju, 2008), Brazil (Hanashiro et al., 2005), China (Ma et al., 2019), , and Nigeria (Aluh & Aluh, 2017) where females were 78% ,56.6%, 66%, and 94.1% respectively. This may be due to the fact that women are expected to be active in food handling activities because they are traditionally responsible for, and adept at, food preparations, handling as well as providing food for households (Omari et al., 2018). This can be attributed to the fact that women in underdeveloped nations have a long history of low educational attainment and unemployment which result to street vending entrepreneurship. However, contrary to the current findings, majority of respondents in similar studies in India were males (Bhowmik & Saha, 2012 & Singh et al., 2017).

The mean age of the respondents was 33.10 ± 9.06 years. This was analogous to previous studies from Ghana (Monney et al., 2013) and India (Bhowmik & Saha, 2012), with about 70% of the vendors having ages within the age range reported in this study. According to a study conducted in Nigeria by Bamidele et al., (2015), this population group is made up of young adults who are expected to work and contribute their fair share to economic growth. This age group may be influenced by social conditions such as unemployment and may venture into food vending services to attend to immediate needs of their family.

Regarding the educational status of respondents, 51.1% had basic education, 17.9% had secondary education, and 2.4% had tertiary education, with the remaining 28.5% of the respondents having no formal education. The findings of this study were consistent with the results of a study

conducted by Nkosi & Tabit, (2021) in South Africa were about 46 % of the respondents had attained basic education. In Bangladesh, Hossen et al., (2021) showed that 47% of food vendors had attained basic education as their highest qualification. These findings could mean that even though there are persons who have obtained higher certificate to handle food, the majority of food vendors do not possess the requisite knowledge on food nutrition. The implication may be that most of the foods on the street may not be balanced and adequate food safety and hygiene measures may not be adhered to which can increase the incidence of infectious diseases such as typhoid, cholera etc. In contrast to the current findings, a study in Brazil by Auad et al., (2019) observed a higher proportion of high levels of training and educational attainment.

The findings of this study revealed that, 57.1% of the respondents had not received training on nutrition. This implies that most of the respondents would rely on their basic knowledge in nutrition that may not be adequate.

It is also interesting to note that, about 53% of the respondent had no training on food safety. This can be as a result of about 57% of the respondents not prioritizing training on nutrition knowledge. Implication of this may be that these categories of food vendors would lack knowledge on nutrition and food safety leading to bad food safety and hygienic practices.

5.2 Operational characteristics of the Respondents

On the type of food sold, the study revealed that food vendors on various food selling points in the metropolis sold banku (9%), fried rice (8%), kenkey (14%) and waakye (18%). However, majority (51%) of the respondents indicated other foods comprising fufu, rice balls, fried yam, jollof, indomie, Beans, touzafi etc. The findings show that waakye and kenkey are the foods that are mostly patronized by food vendors in the metropolis with banku being the least sold food in the study area. This study agreed with the findings of a study conducted in South Africa where

majority of vendors sold multiple culinary items, while others specialized on a single type of food (Hill et al., 2019). However, the results of the current study and those of the South African study differ in terms of the main categories of food items sold. The kind of foods commonly sold in the South Africa study were snacks crisps, candy bars, biscuits (45%), sweetened beverages or flavoured water (6%), fruits and vegetables (26%), cooked food (28%), raw food (4%), tea and coffee (1%) (Hill et al., 2019). The difference in the main food categories could be attributed to the differing food preferences, choices, culture and habits in the two settings.

An important finding of this study was that majority (87.7%) of the food vendors did not have a business certificate. These findings contrast the findings of a study in Sudan that reported that 64% of street food vendors were certified (Abdalla et al., 2009) but was similar to the findings of Choudhury et al., (2011), where none of the food vendors were certified in a study conducted in India and also findings from (Hill et al., 2019) in South Africa in which majority (68.8%) of the respondents did not have any form of certification. The implication of these findings may be that, most of the respondents would operate in low standards with respect to hygienic practices and can carry out any dubious activities since they do not have records with the regulating agencies.

Food handlers should be medically evaluated, according to both the WHO and the FAO. This is to avoid the spread of infectious diseases among food handlers and consumers. Findings from this study revealed that 77.6% of the respondents did not undertake any form of medical check-up before the commencement of the food vending business. These however contrast the findings of Apanga et al., (2014) in a study in rural northern Ghana where 71% of the food vendors had undergone medical screening. The implications may be that majority of the respondents may transmit some communicable diseases on the foods they sell. The food safety regulators should be firm in ensuring that only persons with the right qualification, medical fitness and appropriate

infrastructure for handling food should be allowed to operate so as to safeguard the health of the citizens.

5.3 Nutrition knowledge of the Respondents

According to a report by WHO (2015) in its Food Safety Fact Sheet, the burden of food borne affect individuals of all ages, particularly children under the five years, who account for over 40% of the worldwide burden, as well as people living in low-income areas. Africa is noted for the largest burden of food borne diseases per population, despite significant regional variances in the worldwide burden of food associated diseases. The study investigated the proportion of food vendors who responded correctly on various test questions related to nutrition.

The findings from this present study revealed that only a few (22%) respondents knew which foods help to build the body. This may be ascribed to the fact that the respondents could not differentiate between foods that help build the body and foods that gives the body energy because of their similarities in functioning.

According to this study, only 14% of the respondents knew the various ways to preserve the nutrient value of foods. This woefully inadequate knowledge score may be ascribed to the fact that most of the respondents lacked training on nutrition and food safety. The implications may be that most of the foods sold may be lacking important nutrients since vital nutrients can be lost during food preparations.

According to this study, over 60% of the respondents were found to be strong in identifying the role of various food groups. These findings are similar to the findings of Spronk et al., (2014) in Ethiopia which found 72.1% of the respondents knowing that carbohydrate gives energy to the body whiles 75.9% identified blood giving foods and 55.6% knew what a balance diet. The

implication may be that foods sold comprises different varieties and gives the consumer the chance to buy the class of food nutrient preferred.

5.4 Food safety knowledge of SFVs in the Tamale metropolis

This study assessed food vendors knowledge on ways by which food can be contaminated in which 87.3% of the respondents said poor personal hygiene could lead to food contamination. These findings were consistent to those of a study conducted in Bangladesh by Hossen et al., (2021) where 99% of the respondents agreed that poor personal hygiene can lead to foodborne illness. These similarities could be as a result of similar education backgrounds of the participants in the respective studies.

The current study revealed that nearly 65% of respondents stated that time-temperature abuse could lead to food contamination. In line with this finding, other studies have emphasized the need to ensure that time and temperature used for cooking is enough to ensure non-spore forming pathogenic micro-organisms are destroyed (Omemu & Aderoju, 2008).

The majority of the respondents surveyed reportedly thought poor sale could lead to food contamination. This may be ascribed to the fact that most of the SFVs lack basic facilities such as storage devices where left-over food can be stored when they record low sales. Also, because they do not want to run at loss, they may just heat the food and bring it back to the market to sell. The regulatory bodies would need to periodically inspect the storage facilities of these vendors to forestall the habit of selling contaminated food to the general public.

5.5 Attitudes of SFVs towards food safety and hygienic practice in the Tamale metropolis

The current study showed that, the attitude of SFVs towards food safety and hygienic practice was generally positive. The study also found a significant positive attitude of SFVs towards food safety

and their hygienic practice score. These findings are similar to those of previous studies. A study conducted by Iwu et al.,(2017) in Nigeria revealed that behaviour was significantly associated with the level of food hygienic practice. According to a study conducted by Auad et al., (2019) in Brazil, there is a significant impact of food safety training on attitudes. This is not surprising as one would expect that high scores on attitude would lead to good practice. One would observe that most of the respondents in the current study had some level of education, which may explain the high score of respondents since formal education has the possibility of improving attitude.

Majority (80.5%) of the respondents agreed that hand washing before food handling reduces risk of food poisoning. These findings were supported by a study conducted by Addo et al., 2016) in southern Ghana where almost all of the respondents agreed that hand hygiene prevents food borne diseases. This implies that food sold may be free from personal contamination and safe for the public. Besides, the current study also revealed that over three-quarter agreed that an important job responsibility of SFVs is to safely handle food to promote safe food and hygienic practice.

5.6 Food safety and hygienic practice of SFVs in the Tamale metropolis

Assessing food safety and hygienic practice among SFVs have become vital due to increase in reports of health problems connected with poor food hygiene. The results of the study on food safety and hygienic practice indicated that, on inspection of hazards that may lead to food contamination, majority (78.8%) of the respondents handled money and food simultaneously. A similar study conducted in Nigeria by Chukuezi, (2010) found 61.9% of the respondents handled money while serving food. These findings are concerning given that it may lead to the introduction of microbes to the food which could lead to foodborne illness when consumed. The food vendors need to be given periodic training on cross contamination of this nature and also the regulating authorities need to beef up their surveillance to reduce the occurrence of these sort of practices.

On further inspection of the hazards, it was detected that about half of the respondents showed flu-like symptoms (48.8%). These findings contrast a study conducted in South Africa by Hill et al., (2019) where only 9% of the respondents showed flu-like symptoms. According to a study conducted by Apanga et al., (2014) on food safety awareness and practice of SFVs in rural Northern Ghana, the amount of understanding of food safety and hygienic practices among SFVs was extremely high, however this knowledge was rarely put into effect. A study by Ma et al., (2019) in China showed that street food providers have generally poor food handling practices, and most are operating under unhygienic conditions. These findings are consistent with the current study.

On personal protective clothing inspection of the respondents, a majority had their hair neatly covered (61.3%) but only about half of them used half apron while preparing food (51.7%), with only 37.7% using full apron. More than half of the respondents (57.8%) did not use hand gloves during serving food and preparations. Chukuezi, (2010) in Nigeria reported opposite findings, where 43% did not use apron and 52% did not cover their hair. It's possible that the large proportion of vendors wearing aprons and head coverings is related to a cultural norm or value requiring women to cover their heads. Moreover, head coverings may be a result of religious obligations in the study context, which require married women's heads to be covered.

On further inspection of food safety and hygiene practices with regard to hand hygiene, majority of the respondents did not keep clean and short nails (88.9%) with about half of the respondents having rings on their fingers. This results agrees with those of Steyn et al., (2014) in Ethiopia which revealed that 32% of SFVs had short and clean nails while 34% of the respondents have hands free from sores. The results of this investigation plainly reveal that the vendors' sanitary measures aren't up to par. The handlers are not adequately clothed, and many of their behaviours

can result in microbial contamination of food, putting the general population at danger of food poisoning and other diseases.

5.7 Factors associated with food safety and hygienic practices of SFVs in the Tamale Metropolis

The results of this study showed a weak significant negative correlation ($r = -0.100$, $p = 0.004$) between food safety practice scores and the number of days food vendors worked per week. This can be ascribed to the fact that, the continuous engagement of SFVs over the years, makes one to become too familiar with the job which may affect their efforts of doing the right thing since they may take things for granted as their practices are not regularly monitored. Despite the income generated as a result of continuous sales of food, food vendors need to prioritize the safety of the public and adopt safe hygienic practices.

One of the study's most noteworthy findings is that street food vendors who had attained high level of education had significantly higher practice scores compared to their counterparts that had low level of education. This finding is similar to those reported by Hossen et al., (2021) among food vendors in Bangladesh in which the level education had a substantial impact on the vendors' food safety and hygiene procedures. Most food preparation skills, personal hygiene, and cleanliness are learnt from friends, instructors, and the media and these could be the reason for the current finding. However, a lesser degree of education diminishes awareness, whereas a higher level of education improves understanding, which influences one's attitude and, eventually, hygiene behaviours. It means that SFVs should be encouraged to obtain at least a basic level education before pursuing a career in the kitchen.

The study found that SFVs who were stationary had significantly higher practice scores compared to their counterparts that were mobile in their operations. This could be due to the challenges of

observing food safety practices while carrying the food around. Also, some of the items used to ensure food safety may be difficult to carry around.

The present study showed that SFVs who had gone through a medical check-up before starting their business had a significantly higher practice scores compared to those who did not undertake medical check-up before commencing their business. Studies conducted by Adane et al., (2018) & Azanaw et al., (2019) both in Ethiopia supports this findings by revealing in their respective study that, medical check-up was significantly associated with good levels of food hygiene and safety practice by food handlers. This could be credited to the fact that the vendors are conscious about safety of the food they sell in order to promote public health.

The present study revealed that street food vendors who cooked on site had significantly higher food safety and hygienic practice scores compared to their counterparts who cooked at home. This could be as a result of vendors wanting to do the right thing for the public to patronize their food.

Furthermore, the study revealed that street food vendors who had a business certificate had significantly higher practice scores compared to their colleagues who had no business certificate. This can be attributed to the fact that they followed the protocols of the business given them during the process of the business registration. This was supported by a study conducted by Addo-Tham et al., (2020) in Ghana that revealed that food safety practices were associated with license status ($p = 0.002$).

In the present study there was a negative relationship between number of working hours and food safety and hygienic practice scores. This maybe as a result of fatigue during longer working hours which may lead to not observing some of the protocols of food safety and hygienic practices.

An important finding of this study was that food safety knowledge scores were positively and significantly associated with the food safety and hygienic practice scores of the respondents. This may be ascribed to the fact that, vendors with higher knowledge may have better education and training in food safety. Several studies have previously reported a positive association between level of awareness, attitude and food safety training with SFVs' hygienic practices (Afolaranmi et al., 2015; Rahman et al., 2016 & Tessema et al., 2014).

Again, SFVs attitudes had a significant and positive association with their food safety and hygienic practice scores. These findings were similar to a study conducted by Iwu et al., (2017) in Nigeria which found that food vendors' attitude were substantially linked to their level of hygienic standards. This may be due to their level of food safety expertise, as well as the type of food safety training courses they have undergone.

5.8 Strengths and Limitations of the Study

This current study contributes new knowledge on the topic particularly in the Northern Region of Ghana, where studies on the topic are scarce. The findings could be useful for providing targeted education to food vendors in the region.

The cross-sectional design of this study has limitations, making causality difficult to identify. Another limitation of this study is that it was limited to the Northern Region of the country, where the community is primarily Dagombas, and the sample size was conveniently chosen. The self-reported nature of the questionnaires may create potential sources of recall and social desirability bias.

5.9 Implications of the findings of the study to clinical and public health

The findings of this study provide important themes and topics that could be useful in creating awareness among the SFVs regarding food safety and hygienic practice. Also, the findings of this study would also be useful in terms of helping public health experts to design food and nutrition policies to safeguard the safety and well-being of the general public.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATION

6.0 Introduction

This chapter contains a summary of the entire study based on the results and discussions. This chapter also outlines some recommendations and study limitations.

6.1 Summary of the findings

The study revealed that 83.5% of the SFVs were females with a mean age of 33.10 ± 9.06 years. The study also found 51.1% of the respondents had basic education, 17.9% had secondary education, and 2.4% had tertiary education, with the remaining 28.5% of the respondents having no formal education. Furthermore, over half the respondents have not received training in food safety and nutrition and over two-thirds do not have a business certificate.

The food vendors had mean nutrition-related knowledge of 7.08 ± 1.75 with minimum score of 1.0 and maximum score of 11. This high knowledge score did not translate into practice. Only one-eighth of the respondents knew the various ways to preserve the nutrient value of foods. However, over 60% of the respondents were found to be strong in identifying the role of various food groups to the body.

The food vendors generally had a positive attitude towards, score on food safety and hygienic practices as majority of the respondents agreed that food poisoning can be avoided by washing hands before touching food.

The mean score on food safety and hygienic practice of the respondents were not optimal. However, majority of the respondents neatly had their hair covered while serving and preparing food and also about half of the respondents use half apron while preparing and serving food.

Lastly, number of hours worked, food hygiene and safety knowledge, education, attitude, having a business certificate, mode of operation of food vending business (stationary or mobile), medical check-up and where food were cooked were found to associated with the food safety and hygienic practice of the food vendors.

6.2 Conclusion

The nutrition-related knowledge was generally good although some notable deficiencies were identified. The food vendors attitude towards food safety and hygienic practice was commendable. However, several of the actual food handling techniques by street vendors pose severe concerns. Despite the vendors' good attitude toward food safety and hygienic practice, non-compliance was noted; some did not wear hand gloves during food preparation and serving, and majority did not wear aprons throughout food processing and serving. As a result of this observation, it may be determined that the vendors require food safety and hygiene training. Food handlers should consequently receive training and attend educational sessions to ensure that they follow the necessary regulations for adequate hygiene and sanitation.

Food safety and hygienic practice is influenced by education level, having a business certificate, number of hours worked, having medical check-up, mode of operation of food vending business (stationary or mobile) and food hygiene and safety knowledge.

6.3 Recommendations

In line with the study objectives and the findings of this study, the following recommendations are made.

- With an ever-increasing number of food vendors and their access to an ever-increasing consumer base, the Food and Drug Authority should increase their surveillance and control of food vendor practices.
- The local government should legislate food safety standards based on WHO recommendations and conduct frequent inspections of sanitary and hygienic conditions.
- The Tamale Metropolitan Assembly, in partnership with the Food and Drugs Authority, should develop an inclusive food safety policy and guidelines to guide food vendors in the Metropolis on the do's and don'ts of food preparation and sales, with their duties and responsibilities clearly outlined.
- The FDA, as the government agency responsible for ensuring food safety should enforce a strict compliance with excellent food safety and hygienic practice by requiring food handlers to complete food safety training organized by the sanitation and hygiene division of the metropolis on safe food handling before being registered
- The hygiene and environmental health unit of the metropolitan assembly should provide training at no cost to the food vendor, and at the conclusion of each training program, a certificate should be given as a motivator.

6.4 Suggestion for Further Study

More research is needed in other districts and municipalities in the northern area, as well as in other parts of Ghana, to explicate the current study's conclusions. Furthermore, future research

should investigate the microbial organism in foods sold in the Tamale metropolis as a result of poor personal hygiene.

REFERENCES

- Abdalla, M. A., Suliman, S. E., & Bakhiet, A. O. (2009). Food safety knowledge and practices of street food-vendors in Atbara City (Naher Elneel State Sudan). *African Journal of Biotechnology*, 8(24), 6967–6971. <http://www.academicjournals.org/AJB>
- Adane, M., Teka, B., Gismu, Y., Halefom, G., & Ademe, M. (2018). Food hygiene and safety measures among food handlers in street food shops and food establishments of Dessie town, Ethiopia: A community-based cross-sectional study. *PLoS ONE*, 13(5).
<https://doi.org/10.1371/journal.pone.0196919>
- Addo-Tham, R., Appiah-Brempong, E., Vampere, H., Acquah-Gyan, E., & Gyimah Akwasi, A. (2020). Knowledge on Food Safety and Food-Handling Practices of Street Food Vendors in Ejisu-Juaben Municipality of Ghana. *Advances in Public Health*, 2020.
<https://doi.org/10.1155/2020/4579573>
- Addo, M. G., Addo, *, Acheampong, M. G., & And Akanwariwiak, I. A. (2016). *Assessment Of Microbial Quality And Heavy Metal Levels Of Raw Cattle Hide And Meat Sold At Retail Outlets In Tarkwa, Ghana*. <https://www.researchgate.net/publication/332621599>
- Afolaranmi, T. O., Hassan, Z. I., Bello, D. A., & Misari, Z. (2015). Knowledge and practice of food safety and hygiene among food vendors in primary schools in Jos, Plateau State, North Central Nigeria. *E3 Journal of Medical Research*, 4(2), 16–022.
- Ahmed, Z., Afreen, A., Hassan, M. U., Ahmad, H., Anjum, N., & Waseem, M. (2017). Exposure of Food Safety Knowledge and Inadequate Practices among Food Vendors at Rawalpindi; the Fourth Largest City of Pakistan. *Journal of Food and Nutrition Research*, 5(1), 63–73.

<https://doi.org/10.12691/jfmr-5-1-10>

Akabanda, F., Hlortsi, E. H., & Owusu-Kwarteng, J. (2017). Food safety knowledge, attitudes and practices of institutional food-handlers in Ghana. *BMC Public Health*, 17(1).

<https://doi.org/10.1186/s12889-016-3986-9>

Akuu, J. A., Danyi, D., & Dapaah, C. (2017). Factors associated with poor food safety compliance among street food vendors in the Techiman Municipality of Ghana. *African Journal of Food Science*, 11(3), 50–57. <https://doi.org/10.5897/ajfs2016.1510>

Aluh, F. O., & Aluh, D. O. (2017). Knowledge, attitudes and practices of food hygiene among mobile food vendors in a Nigerian rural settlement. *International Journal Of Community Medicine And Public Health*, 4(11), 4025. <https://doi.org/10.18203/2394-6040.ijcmph20174812>

Aluko, O. O., Ojeremi, T. T., Olaleke, D. A., & Ajidagba, E. B. (2014). Evaluation of food safety and sanitary practices among food vendors at car parks in Ile Ife, southwestern Nigeria. *Food Control*, 40(1), 165–171. <https://doi.org/10.1016/j.foodcont.2013.11.049>

Apanga, S., Bendeck, M. A., Efanu Marras, S., Addah, J., & Sey, D. R. (2014). Food Safety Knowledge and Practice of Street Food Vendors in Rural Northern Ghana Related papers Street Food In Urban Ghana. A desk top review and analysis of findings and recommendations ... Food Safety Knowledge and Practice of Street Food Vendors in Rural Northern Ghana. *Public Health*, 4(3), 99–103. <https://doi.org/10.5923/j.fph.20140403.05>

Arksey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology: Theory and Practice*, 8(1), 19–32.

<https://doi.org/10.1080/1364557032000119616>

Auad, L. I., Ginani, V. C., Stedefeldt, E., Nakano, E. Y., Nunes, A. C. S., & Zandonadi, R. P.

(2019). Food safety knowledge, attitudes, and practices of brazilian food truck food handlers. *Nutrients*, *11*(8). <https://doi.org/10.3390/nu11081784>

Azanaw, J., Gebrehiwot, M., & Dagne, H. (2019). Factors associated with food safety practices

among food handlers: Facility-based cross-sectional study. *BMC Research Notes*, *12*(1). <https://doi.org/10.1186/s13104-019-4702-5>

Bamidele, J., Oladele, E., Adeoye, O., & Adebimpe, W. (2015). Hygiene practices among

workers in local eateries of Orolu community in south Western Nigeria. *Annals of Medical and Health Sciences Research*, *5*(4), 235. <https://doi.org/10.4103/2141-9248.160176>

Bhowmik, S. K., & Saha, D. (2012). *Street Vending in Ten Cities in India*.

Choudhury, M., Mahanta, L. B., Goswami, J. S., & Mazumder, M. D. (2011). Will capacity

building training interventions given to street food vendors give us safer food?: A cross-sectional study from India. *Food Control*, *22*(8), 1233–1239.

<https://doi.org/https://doi.org/10.1016/j.foodcont.2011.01.023>

Chukuezi, C. O. (2010). Food Safety and Hygienic Practices of Street Food Vendors in Owerri,

Nigeria. *Studies in Sociology of Science*, *1*(1), 50–57. www.cscanada.net

Franz, C. M. A. P., den Besten, H. M. W., Böhnlein, C., Gareis, M., Zwietering, M. H., & Fusco,

V. (2019). Reprint of: Microbial food safety in the 21st century: Emerging challenges and foodborne pathogenic bacteria. In *Trends in Food Science and Technology* (Vol. 84, pp. 34–37). Elsevier Ltd. <https://doi.org/10.1016/j.tifs.2019.01.009>

Gelormini, M., Damasceno, A., Lopes, S. A., Maló, S., Chongole, C., Muholove, P., Casal, S.,

- Pinho, O., Moreira, P., Padrão, P., & Lunet, N. (2015). Street Food Environment in Maputo (STOOD Map): A cross-sectional study in mozambique. *JMIR Research Protocols*, *4*(3).
<https://doi.org/10.2196/resprot.4096>
- Ghana Statistical Service. (2021). *Administrative Map Of Ghana*.
- Hanashiro, A., Morita, M., Matté, G., Matté, M., & Torres, E. (2005). Microbiological quality of selected street foods from a restricted area of São Paulo City, Brazil. *Food Control*, *16*, 439–444. <https://doi.org/10.1016/j.foodcont.2004.05.004>
- Hawkins, D. L. (1989). Using U Statistics to Derive the Asymptotic Distribution of Fisher's Z Statistic. *The American Statistician*, *43*(4), 235–237.
<https://doi.org/10.1080/00031305.1989.10475666>
- Hill, J., Mchiza, Z., Puoane, T., & Steyn, N. P. (2019). Food sold by street-food vendors in Cape Town and surrounding areas: a focus on food and nutrition knowledge as well as practices related to food preparation of street-food vendors. *Journal of Hunger and Environmental Nutrition*, *14*(3), 401–415. <https://doi.org/10.1080/19320248.2018.1434104>
- Hossen, M. T., Ferdaus, M. J., Hasan, M. M., Lina, N. N., Das, A. K., Barman, S. K., Paul, D. K., & Roy, R. K. (2021). Food safety knowledge, attitudes and practices of street food vendors in jashore region, bangladesh. *Food Science and Technology (Brazil)*, *41*, 226–239.
<https://doi.org/10.1590/fst.13320>
- Iwu, A. C., Uwakwe, K. A., Duru, C. B., Diwe, K. C., Chineke, H. N., Merenu, I. A., Oluoha, U. R., Madubueze, U. C., Ndukwu, E., & Ohale, I. (2017). Knowledge, Attitude and Practices of Food Hygiene among Food Vendors in Owerri, Imo State, Nigeria. *Occupational Diseases and Environmental Medicine*, *05*(01), 11–25.

<https://doi.org/10.4236/odem.2017.51002>

Kubde, S., Pattankar, J., & Kokiwar, P. (2016). Knowledge and food hygiene practices among food handlers in food establishments. *International Journal of Community Medicine and Public Health*, 251–256. <https://doi.org/10.18203/2394-6040.ijcmph20151572>

Labadarios, D., Steyn, N. P., & Nel, J. (2011). How diverse is the diet of adult South Africans? *Nutrition Journal*, 10(1). <https://doi.org/10.1186/1475-2891-10-33>

Lamin-Boima, P. T. (2017). Knowledge, Attitude And Practice Of Street Food Vendors In Selected Schools Within Bo City Southern Sierra Leone. *International Journal Of Scientific & Technology Research*, 6. www.ijstr.org

Lamuka, P. O. (2014). Public Health Measures: Challenges of Developing Countries in Management of Food Safety. In *Encyclopedia of Food Safety* (Vol. 4, pp. 20–26). Elsevier. <https://doi.org/10.1016/B978-0-12-378612-8.00310-3>

Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry*, 7(1), 24–25. <https://doi.org/10.1038/sj.ebd.6400375>

Liu, Z., Zhang, G., & Zhang, X. (2014). Urban street foods in Shijiazhuang city, China: Current status, safety practices and risk mitigating strategies. *Food Control*, 41(1), 212–218. <https://doi.org/10.1016/j.foodcont.2014.01.027>

Lues, J. F. R., Rasephei, M. R., Venter, P., & Theron, M. M. (2006). Assessing food safety and associated food handling practices in street food vending. *International Journal of Environmental Health Research*, 16(5), 319–328. <https://doi.org/10.1080/09603120600869141>

- Ma, L., Chen, H., Yan, H., Wu, L., & Zhang, W. (2019). Food safety knowledge, attitudes, and behavior of street food vendors and consumers in Handan, a third tier city in China. *BMC Public Health*, *19*(1). <https://doi.org/10.1186/s12889-019-7475-9>
- Mensah, P., Yeboah-Manu, D., Owusu-Darko, K., & Ablordey, A. (n.d.). *Street foods in Accra, Ghana: how safe are they?*
- Monney, I., Agyei, D., & Owusu, W. (2013). Hygienic practices among food vendors in educational institutions in Ghana: The case of Konongo. *Foods*, *2*(3), 282–294. <https://doi.org/10.3390/foods2030282>
- Muyanja, C., Nayiga, L., Brenda, N., & Nasinyama, G. (2011). Practices, knowledge and risk factors of street food vendors in Uganda. *Food Control*, *22*(10), 1551–1558. <https://doi.org/https://doi.org/10.1016/j.foodcont.2011.01.016>
- Nkosi, N. V., & Tabit, F. T. (2021). The food safety knowledge of street food vendors and the sanitary conditions of their street food vending environment in the Zululand District, South Africa. *Heliyon*, *7*(7). <https://doi.org/10.1016/j.heliyon.2021.e07640>
- Omari, R., Frempong, G. K., & Arthur, W. (2018). Public perceptions and worry about food safety hazards and risks in Ghana. *Food Control*, *93*, 76–82. <https://doi.org/10.1016/j.foodcont.2018.05.026>
- Omemu, A. M., & Aderoju, S. T. (2008). Food safety knowledge and practices of street food vendors in the city of Abeokuta, Nigeria. *Food Control*, *19*(4), 396–402. <https://doi.org/10.1016/j.foodcont.2007.04.021>
- Rahman, M., Arif, M. T., Bakar, K., & Bt Tambi, Z. (n.d.). *Food Safety Knowledge, Attitude And*

Hygiene Practices Among The Street Food Vendors In Northern Kuching City, Sarawak .

- Samapundo, S., Climat, R., Khaferi, R., & Devlieghere, F. (2015). Food safety knowledge, attitudes and practices of street food vendors and consumers in Port-au-Prince, Haiti. *Food Control*, 50, 457–466. <https://doi.org/10.1016/j.foodcont.2014.09.010>
- Singh, T., Sharma, S., & Nagesh, S. (2017). Socio-economic status scales updated for 2017. *International Journal of Research in Medical Sciences*, 5(7), 3264. <https://doi.org/10.18203/2320-6012.ijrms20173029>
- Spronk, I., Kullen, C., Burdon, C., & O'Connor, H. (2014). Relationship between nutrition knowledge and dietary intake. In *British Journal of Nutrition* (Vol. 111, Issue 10, pp. 1713–1726). Cambridge University Press. <https://doi.org/10.1017/S0007114514000087>
- Steyn, N. P., Mchiza, Z., Hill, J., Davids, Y. D., Venter, I., Hinrichsen, E., Opperman, M., Rumbelow, J., & Jacobs, P. (n.d.). 1363-1374 for Science, Technology and Innovation Indicators (CeSTII). 6, 17. <https://doi.org/10.1017/S1368980013001158>
- Tessema, A. G., Gelaye, K. A., & Chercos, D. H. (2014). Factors affecting food handling Practices among food handlers of Dangila town food and drink establishments, North West Ethiopia. *BMC Public Health*, 14(1). <https://doi.org/10.1186/1471-2458-14-571>

APPENDIX 1: QUESTIONNAIRES

QUESTIONNAIRES

Socio-demographic characteristics

1. Gender

[1] Male [2] Female

2. Age

.....

3. Marital status

[1] Single [2] married [3] divorced [4] separated

4. Education

[1] None [2] primary [3] JSS [4] SSS/SHS [5]
Tertiary

5. Ethnicity

[1] Dagomba [2] Akan [3] Gonja [4] others

6. Religion

[1] Islam [2] Christianity [3] Traditionalist [4]
Other

7. Other occupation

.....

8. How many persons have you employed to help you with your street food vending

.....

9. Is your street food stationary or mobile?

[1] Stationary [2] Mobile

10. Duration of food vending (years)

.....

11. Have you ever received training on food safety?

[1] Yes [2] no

12. Have you received training on nutrition?

1. Yes 2. No

Operational characteristics

1. Type of food sold

[1] kenkey [2] fried rice [3] banku [4] wakye [5] others

2. How many days do you work per week?

.....

3. How many hours do you work per day?

.....

4. Do you have a business certificate?

[1] Yes [2] No

5. Did you do a medical checkup before commencing the food vending business?

[1] Yes [2] No

1. Do you always do medical examination check every year

[1] Yes [2] No

6. Are you the owner of the business?

[1] Owner [2] joint owner [3] non owner

7. Facilities available

[1] Water [2] electricity [3] fridge [4] Rubbish disposal

8. Who cook the food?

[1] Self [2] spouse [3] employers [4] Mix

9. Where is the food cooked?

[1] Home [2] on site

10. What happens to leftover food?

[1] Thrown away [2] taken home to eat [3] given away [d] sold the next
day

Nutrition Knowledge

1. Which foods help fight disease and builds immunity

[1] Carbohydrates [2] fruits and vegetables [3] proteins

2. What nutrient is provided by energy given foods?

[1] Carbohydrate [2] protein [3] fats [4] minerals

3. Which of the following foods helps to build the body?

[1] Chicken [2] Frytol [3] Tuo-Zaafi [4] Corn

4. Which of the following foods provides the body with blood?

[1] Beans [2] Rice [3] Gari [4] wasa-wasa

5. Which food is good for a healthy heart?

[1] Fried chicken [2] Fruits and vegetables [3] Roasted beef [4] alcohol

6. Which of the following foods do not have added sugar?

[1] Avocado [2] yogurt [3] energy drinks

7. A balanced diet consist of

[1] Energy foods only [2] body building foods only [3] health protective foods only

[4] All of these foods in their right proportion

8. Which of the following diseases could be caused by excessive intake of salt?

[1] Hypertension [2] Stroke [3] night blindness [4] Don't know

9. Prolonged cooking of foods such as vegetables can lead to

[1] Loss of taste [2] loss of nutrients [3] makes digestion easy

10. The following are some of the ways to preserve nutrient value of food except

[1] Use fresh foods [2] Cook for the shortest time possible [3] serving immediately after cooking

11. Nutrient loss can be alleviated through

[1] Re-use of cooking water [2] washing food well before cooking [3] Cooking raw food fast

Food safety knowledge questions

14. Cooking food helps in the following?

[1] Digest food easily 1. Yes 2. No

[2] adding variety to food 1. Yes 2. No

[3] adding flavours to food 1. Yes 2. No

[4] Making food safe for consumption 1. Yes 2. No

[5] Adding all nutrients 1. Yes 2. No

[5] Don't know

15. The following are ways by which food can be contaminated?

[1] Poor personal hygiene 1. Yes 2. No

[2] Cross contamination 1. Yes 2. No

[3] Time temperature abuse 1. Yes 2. No

- [4] Hair covering 1. Yes 2. No
- [5] Plastic gloves 1. Yes 2. No
3. Hands hygiene
- [1] Clean and short nails 1. Yes 2. No
- [2] Hands free of sores 1. Yes 2. No
- [3.] No rings on the fingers 1. Yes 2. No
4. Food handling
- [1] Separate utensils for cooked and raw food 1. Yes 2. No
- [2] Adequate takeaway containers 1. Yes 2. No
- [3] Adequate cutlery 1. Yes 2. No
- [4] Clean cutlery 1. Yes 2. No
- [5] Cooked food kept covered 1. Yes 2. No
5. Method of hand- and dishwashing and surface cleaning
- [1] Basin/bottled water 1. Yes 2. No
- [2] Soap 1. Yes 2. No
- [3] Antiseptic 1. Yes 2. No
- [4] Cloth to dry hands 1. Yes 2. No
- [5] Clean wet sponge/cloth 1. Yes 2. No

[6] Clean dry sponge/cloth

1. Yes 2. No

6. General cleanliness of vending site

[1] Very clean [2] somehow clean [3] clean [4] not clean

Attitudes of street food vendors towards food safety and hygienic practice

Statements	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Producing safe food is more important than tasty food					
Well cooked food are free from contamination					
Raw and cooked food should be stored separately to reduce the risk of contamination					
Food should not be touched with wounded hands					

Reuse of oil is harmful for health					
Good personal hygiene can prevent foodborne illness					
Unsafe food can result in illness					
Washing hands before handling food reduces risk of food poisoning					
Safe food handling is an important part of your job responsibility					
Poor personal hygiene can lead to contamination of food					
Over cooking food can lead to loss of nutrient					
Diet diversity is a key indicator of nutrition quality					

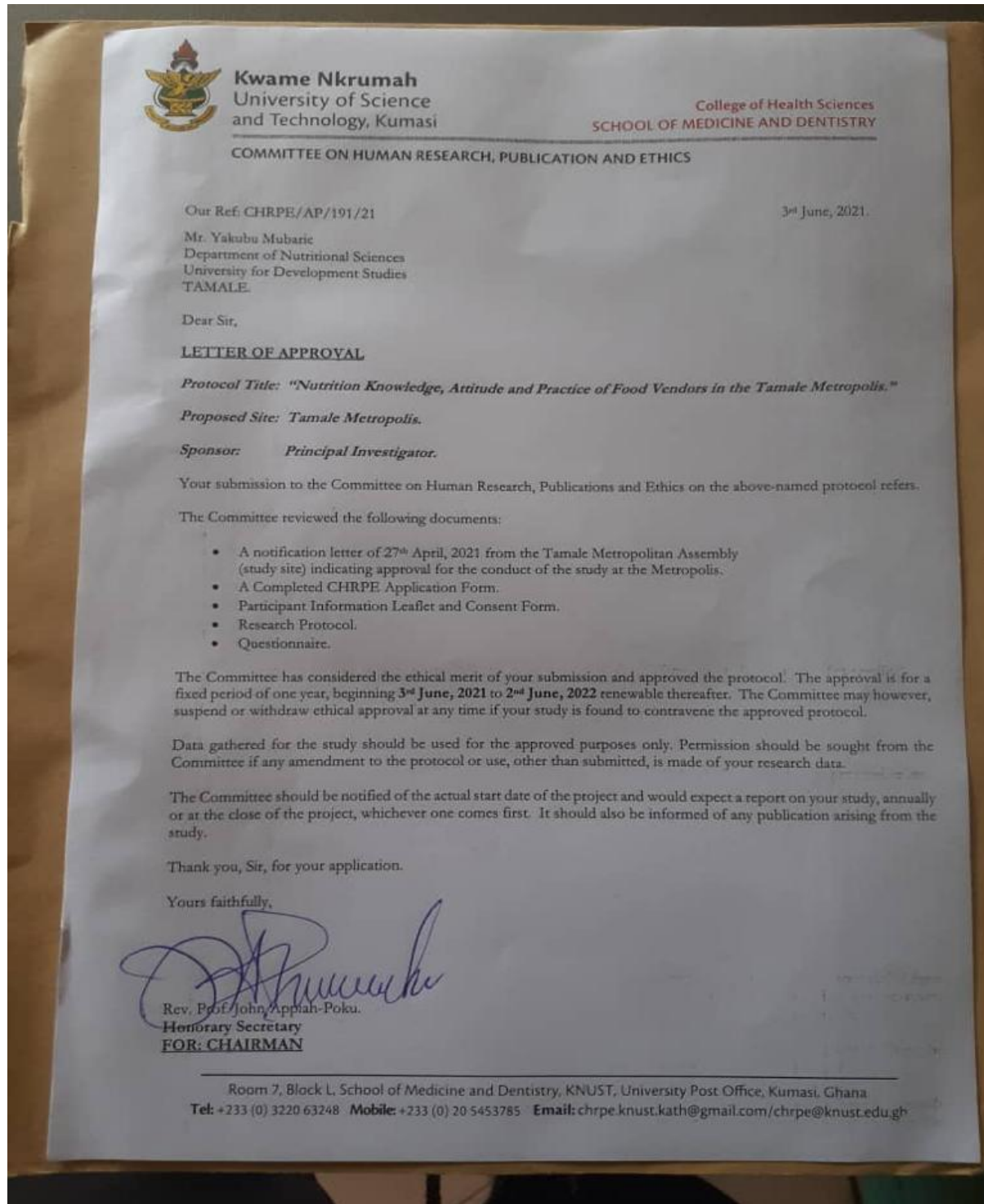
4. Do you consider the nutrition quality of food you sell?

[1] Yes [2] No

5. Do u consider the cooking method because of nutrition quality of the food you sell?

[1] Yes [2] No

APPENDIX 2: ETHICAL CLEARANCE



APPENDIX 3: LETTER FROM STUDY AREA

