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Hygienic Practices Among Vegetable Sellers: Empirical Evidence from Agona Market in the Sekyere South District of the Ashanti Region

[1]Patience Darko, [2] Fuseni Alhasan [3] Prince Musah Saeed
1 University of Education, Winneba, Department of Food and Nutrition
2 University of Education, Winneba, Department of Food and Nutrition
3 Department of Family and Consumer Sciences, University for Development Studies, Nyankpa Campus-Tamale.

Abstract

The study focused on assessing the hygiene practices among vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region. The study used exploratory descriptive research design with both qualitative and quantitative methods to collect data. Two Instruments comprising semi-structured interview and structured questionnaires were used. The total sample size was 288, made up of 286 vegetable sellers in Agona Market in the Sekyere south district and two (2) senior staff from the health and sanitation units of the Sekyere south district. Convenient sampling and purposive sampling were used to recruit the respondent for this study. All the 286 vegetable sellers were issued a questionnaire, enough time was taken to breakdown all aspects of the questionnaire to them. The researcher had to resort to the various local dialect like Akan (Twi), Hausa, Ga and Dagbani to explain and translate most parts of the questionnaire to the understanding of the respondents. the study found low or insufficient hygiene knowledge among the vegetable Sellers in Agona Market in the Sekyere south district of the Ashanti Region. However, the respondents observe found good hygiene practices, irrespective of their low educational background and poor food hygiene knowledge. This study also found that though the sanitary conditions of the respondents' environment is not hygienic and conductive, some of the vegetable vendors and customers seem not extremely worried about the situation. Finally, this study found; mass education enforcement of the sanitation laws, regular health screening, clearing choked gutter and drainage systems, stakeholder consultation among others. As some of the measures put in place by the district assembly in ensuring food hygiene among the vegetable sellers in Agona Market in the Sekyere south district. Based on the findings of the study, this study recommended that the Sekyere south district of the Ashanti Region need to liaise with the appropriate stakeholders and institutions to develop and implement periodic public education programmes to inform market users about food hygiene, food safety, waste generation and management in order to change their attitudes toward the maintenance of food hygiene in the markets.

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Introduction

The World Health Organization (2015) reports that there approximately two (2) million fatal cases of food poisoning which occur every year globally, especially in developing countries. This could be attributed to poor state of food safety and general hygiene in those countries. Food supply has become complex and involves a range of different stages and safety concerns involving on-farm production, slaughtering or harvesting, processing, storage, transport and distribution before the food reaches the final consumers (FAO, 2014; WHO, 2015). With regards to final consumption of food, meals are either made in homes by either household members or professional caterers (including hired helps) or they are purchased from sources outside the farm from food vendors (Dwumfour-Asare & Agyapong, 2014).

According to Ababio and Lovatt, (2014), the food sector of Ghana includes primary producers, food manufacturers, food handlers and processors which predominantly are of Small and Medium Size enterprises, retailers and table top vendors. The constitution of Ghana provides the Ghanaian the right to health and safety. This right is protected through the regulatory work of state institutions such as the Food and
Drugs Authority (FDA). Part Seven of the Public Health Act, 2012, Act 851 mandates the Food and Drugs Authority (FDA) to protect the Ghanaian public through the regulation of food, drugs, household chemical substances, cosmetics and medical devices (Ghana Standard Authority, 2013).

The Food Laws in Ghana include the Food and Drugs Act PNDCL 305B of 1992 which covers food safety and handling requirements and penalties for breaching the Law. The Food and Drugs Authority (FDA) is the national regulatory body under the Ministry of Health with the responsibility of implementing food policies and ensuring the safety and wholesomeness of food for consumers. The Food Safety Division (FSD) executes the Food and Drugs Authority's (FDA) mandate to protect public health and safety through the regulation of the food

service industry, as well as assuring the safety of genetically modified organisms for food, feed and processing. It also provides technical support to the food industry to promote the production of safe and quality food through the application of contemporary food safety management systems. Other supporting agencies include the Ministry of Health, Ministry of Agriculture, Ghana Tourist Board and the Environmental agency (Ghana Standard Authority, 2013). The Water and Food Hygiene unit of the Environmental Health Department of the districts is responsible for the health monitoring and certification of food vendors which is subject to renewal on a yearly basis (Ababio & Lovatt, 2014). Food hygiene or safety encompasses all conditions and measures necessary to ensure safety and suitability of food at all stages of the chain of food production, that is, the process of handling, preparation, and storage of food, to prevent food borne illness. Food handlers have been found to play prominent roles in the transmission of food borne diseases and can pose a significant public health problem because of their poor knowledge of safe food handling (Chukuezi, 2010). According to Pokhrel and Sharma (2016), unsafe food can lead to a range of health problems: diarrheal disease, viral disease, reproductive, developmental problems and cancers.

Food hygiene consists of several principles adopted to ensure food safety and to protect food from any chemical, microbiological or other type of contamination that can render it unfit for human consumption, to prevent the spread of communicable diseases associated with food and food processing and also to ensure that consumers of food are not fraudulently treated. It also ensures that food when purchased is of a nature, composition and quality as demanded by the purchasers. Proper food hygiene should ensure that food is handled, stored, prepared and served in such a way and under such conditions so as to prevent, as far as possible, the contamination of the food (WHO, 2011) cited by (Pokhrel & Sharma, 2016).

In most developing countries, access to clean water for urban vegetable irrigation is a major challenge. Pathogen-laden sewage water is thus commonly used (Amoah, Drechsel, Abaidoo & Ntow, 2006). Besides, reliance on untreated sewage or polluted water for irrigation leads to excessive built-up of heavy metals in soils, which results in elevated levels of heavy metal uptake by crops (Karanja et al. 2010). These, together with the use of fresh animal manure and pesticides, make vegetables increasingly unsafe for public consumption due to pathogenic, chemical and heavy metal contamination. Beside these primary on-farm sources of contamination, contamination of vegetables also occurs during transport and at market places (Lagerkvist, Hess, Okello, Hansson, & Karanja, 2013).

Over time, handling of vegetables has increasingly raised public concerns due to the potential public health risks. One of the main sources of vegetable contamination is market-related handling practices among vegetable sellers particularly where provision of better sanitary standards such as clean water for washing is lacking (Amoah et al. 2006). The use of one container of water for washing vegetables the whole day as observed by Dreschel et al. (2000) will not only make them dirtier but can have serious health implications especially when consumed unwashed. Exotic vegetables like lettuce, cabbage, spring onions and the like are of particular food safety concern because they are most often eaten raw (Moris & Brady 2005).

Poor personal and environmental hygiene practices, poor storage system as well as display of foodstuffs on the ground, often near open drains, potentially open vegetables to further contamination. In effect, vegetables sold in the markets are greatly exposed to houseflies and other pathogen-carrying insects (Amoah et al. 2011). According to Zu, Wongnaa and Appiah (2014), the stacking of vegetables into jute sacks, storing vegetables in open spaces and transportation in open trucks predispose vegetables to physical damage, high temperature and senescence. Vegetable sellers have also been found to be carriers of Staphylococcus aureus (Saeed & Hamid 2010), an infection from Staphylococcus aureus bacterium (Case, 2004). In developing countries, traditional outlets such as on-farm purchases, open-air markets and kiosk vendors, remain important vegetable purchasing points for many consumers of urban vegetables. In spite of the generally unhygienic practices and poor sanitary conditions in these markets, they continue to serve the majority of urban consumers in developing countries (Tshirley & Ayieko 2008; Lagerkvist et al. 2013). This raises public health concerns; however little information is available on their related diseases and possible Challenges.

Statement of the Research Problem

Food safety is a major public health concern and cases of outbreaks have recently been recorded, both in Ghana and Africa at large (Apanga, Addah, & Sey, 2014). Diarrhea diseases due to contaminated and unhygienic food are among the leading causes of illness and deaths in low-income countries, and several outbreaks of disease have been attributed to consumption of street food. In Ghana, diarrhea has been recognized as one of the major causes of hospitalization, resulting in 16% deaths among African children younger than five years (Feglo, & Sakyi, 2012).

A number of outbreaks communicable diseases have recently been reported in Ghana. It has been estimated that about 5000 children under five years of age die from diarrhoea each year in Ghana (GraphicOnline, 22nd May, 2013). In 2016, nearly 160 cases were reported at health facilities in the Central Region, (myjoyonline, 02-11-2016). The total number of outpatients reported cases of food borne diseases in Ghana is about 420,000 per year,

with an annual death rate estimated at 65,000 and total cost to the economy at US$69 million. The World Health Organisation (WHO) has alluded to the fact that unsafe food poses global health threats and endangers everyone, including infants, young children, pregnant women, the elderly and those with an underlying illness. World Health Organization estimates that about three million pesticide poisoning is recorded annually in developing countries. This accounts for 220,000 deaths annually (Ghanaweb, 8th December, 2015).
Despite these alarming statistics, only few surveys have been done to understand and correlate the causes of food-borne illnesses in Ghana. Food handlers may contaminate food by poor personal hygiene, cross-contaminating raw and processed food, as well as inadequate cooking and improper storage of food. Therefore, this study sought to examine the practices of hygiene among vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region.

Research Questions

1. What is the level of hygiene knowledge among vegetable sellers in Agona Market in the Sekyere south district?
2. What are the sanitary conditions of the environment within which the vegetable sellers in Agona Market in the Sekyere south district operate?
3. What are the roles and measures put in place by the district assembly in ensuring food hygiene among the vegetable sellers in Agona Market in the Sekyere south district?

Significance of the study

This study is important to assess hygiene practices vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region. This study will provide a deeper insight into the sanitary conditions of vegetables, that are sold on the streets and in enclosed places, like the markets and kiosks. The findings of this will create awareness of food safety practices and improve the efficiency of food handler, as well as serve as a guide for further research on food hygiene practices.

Scope and Delimitation of the Study

The main purpose of this study is to assess hygiene practices of vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region. This study primarily emphasized on the hygiene knowledge of the vegetable sellers in Agona Market, the prevailing sanitary conditions of the environment within which the vegetable are sold, as well as the measures put in place by the authorities to ensure food safety and hygiene among the vegetable sellers. The study was restricted to the vegetable sellers and the health and sanitation directorates or units of the Agona Market in the Sekyere south district of the Ashanti Region.

Methodology

Study Design

The study applied both exploratory descriptive research design, thus an exploratory-descriptive study. In the views of Stebbins (2012), exploratory research is used to explore the specific nature of a problem by means of finding out what is happening, to seek in-depth knowledge of the problem, to ask questions and to assess phenomena in a new light. The purpose of explanatory design is to establish causal relationship between studies and variables, meaning that the aim is to study situations or problems, trying to find a relationship between variables; whether a change in one independent variable produces a change in another dependent variable (Erickson, 2017).

On the other hand, descriptive research, according to Sunders (2009), reveals an accurate profile of events, persons or situations. Shields and Rangarajan (2013) portrayed descriptive research as a research design used to describe the characteristics of a population. Therefore, this study seeks to utilise two research approaches; exploratory and descriptive, which according to Sunders (2009), are best suited when there is limited existing information available on a topic. These designs were effective for developing concepts more clearly, establish priorities and develop operational definitions. They also help to attain objectivity and precision to ensure that the data collected are relevant.

Sample size determination

Using a population of 1000, the sample size representative in this study is 286. This is determined based on the sample size calculation formula of Yamane (1964). The researcher employed a statistical model by Yamane (1964) to settle on the sample size at a 95% confidence level with 5% margin of error. The sample size for this study included the total number of households within the study area.

$$n = \frac{N}{1 + N(\partial^2)}$$

Where n= the sample size, N= the sample frame, 1= a constant, and $d = 0.05$ However, the Sekyere South District Assembly projected the population of vegetable seller in Agona Market to be over 1,000 sellers. Therefore,

$$n = \frac{1000}{1 + 1000(0.05^2)} = \mathbf{286}$$

3.0 Inclusion and Exclusion Criteria

- ***Inclusion Criteria-*** study includes all vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region

- ***Exclusion Criteria-*** Individuals who do not sell vegetables in Agona Market in the Sekyere south district of the Ashanti Region

Sampling procedure
The study applied both convenient sampling and purposive sampling design during data collection. Convenient sampling was used to select all the 286 respondents for this study, whereas the Purposive sampling technique was used to recruit the principal heads of health and sanitation units of the Sekyere South District Assembly.

Data collection instrument
This study applied both open ended close-ended questionnaires to obtain data from the respondents. In order to increase validity of the responses, the questionnaires were personally administered by the researcher with the help of four local interpreters. The core function of the interpreters was to read the questions and interpret to respondents. The interpreters were vested in four local languages, Akan (Twi), Hausa, Ga and Dagbani. They were accordingly taken through the rudiments, particularly the objectives of this study, as well as the items that constitutes the research instruments of this study.

Ethical Consideration
The researcher informed and sought the consents of the respondents to participate in this study freely and unconditionally. In addition, this study was solely for academic purposes; therefore, the confidentiality and privacy of the respondents was assured, hence every information or data provided by the respondents was kept confidential.

Data collection procedure
A questionnaire and an interview guide were developed for this study. The questionnaire was divided into four parts, Part I gathered the socio-demographic data of the vegetable sellers. Part II is accessed the hygiene knowledge of the vegetable sellers in Agona Market in the Sekyere south district. Part III examined the sanitary conditions of the environment within which the vegetable sellers in Agona Market in the Sekyere south district operate. Part IV collected data on the roles and measures put in place by the district assembly in ensuring food hygiene among the vegetable sellers in Agona Market in the Sekyere south district.

Data Analysis Procedure
The data collected were checked and edited to avoid inconsistencies, and questionnaires with too many critical unanswered questions were excluded. The data gathered were analysed using SPSS version 25. Descriptive statistics of the data collected was analysed for most variables in the study using statistical parameters: frequency tables and percentages and correlations.

Results and Discussion
This section summarises and discusses the research result, with an attempt to integrate the results into existing literature.

The study collected information on the demographics of the respondent. The Information was collected on the sex of the respondent, age, level of education, selling vegetables, training in Food Safety, and medical screening

records. The question was posed to the respondents about their gender; the aim of analysing gender of respondent is to determine the gender background of the respondents for this study.

Table: 4. 1. Gender of the Respondents

		Frequency	Percent	Cumulative Percent
Valid	Female	273	96.8	96.8
	Male	9	3.2	100.0
	Total	**282**	**100.0**	

Source: Field work, 2021

The data in table 4.1, shows that the 96.8% of the respondents recruited for this study were females, whereas only 3.2% were male. This suggest that there were substantially more female participants than male in this survey. The results also depicts that the majority of the vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region are predominantly women. Nevertheless, this could be attributed the gender proportions as eminent across the various markets in Ghana. This concurs with the findings of many scholars who established that the marketing setting of Ghana is largely dominated by women (e.g Owusu & Lund, 2004; Clark, 2010; House-Midamba & Ekechi, 1995; Dzisi, 2008; Osei-Boateng & Ampratwum, 2011).

Age of the respondents Table: 4. 2: Age of the respondent

	Frequency	Percent	Cumulative Percent
Valid Less than 20 years	4	1.42	1.42
20 - 30 years	81	28.7	30.1
31 - 40 years	156	55.3	85.4
41 - 50 years	27	9.57	95.0
51 - 60 years	14	4.96	100.0
Total	**282**	**100.0**	

Source: Field work, 2021

Data analysis on the ages of the respondents as presented in Table 4.2 above shows that less than 2.0% of the employees were less than 20 years, 28.7% fell within the age bracket of 20-30 years, 55.3% fell within the ages of 31-40 years, 9.576% fell within the ages of 41-50 years and approximately 5.0% fell within the ages of 51- 60 years. This depicts that majority (55.3%) of the respondents to this study fall within the middle age bracket of 31 - 40 years. Nevertheless, cumulatively, about 85% of the respondents to this study fell within youthful age of less than 20 years to 40 years. This results also illustrate significant number of the of the vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region are youth. There many factors that could be attributed to this finding, which may include the youthful age distribution of Sekyere south district of the Ashanti Region, unemployment, cheap capital requirement to trade in vegetables, readily available markets for vegetable trade, among other several factors. That notwithstanding, attracting the interests of the youth towards vegetable trade

signifies the prospects of the industry and it value chain. Also, this result concurs with the finding of Adeniran, Ishaku and Yusuf (2020), Dadzie, Fumey and Namara (2020), Jumpah, Ampadu-Ameyaw and Owusu- Arthur (2020), who in their separate studies found that various markets carters in Ghana is largely dominated by female youth.

4.2.3 Highest Academic qualification

Table: 4. 3. Academic level of Respondents

		Frequency	Percent	Cumulative %
Valid	No formal education	158	56.0	56.0
	Basic Education	54	19.1	75.2
	Secondary/Middle school	41	14.5	89.7
	NVTI/Vocation	12	4.3	94.0
	Tertiary education (Diploma, Degree, Masters etc)	17	6.0	100.0
	Total	**282**	**100.0**	

Source: Field work, 2021

Furthermore, the result from table 4.3 shows majority (56.0%) of the respondents had no formal education, 19.1% had only Basic education, 14.5% had Secondary/Middle school, 4.3% had NVTI/Vocation and 6.0% had Tertiary education (Diploma, Degree, Masters etc). The data from table 4.3 reveals that significant proportion of the respondent had no formal education. However, about 44% of them, at least had some form of education. Education is very essential particularly when it comes to food safety, food handling and hygiene. However, as shown in table 4.3, it is safe to position that the findings of this study are the reflections, perceptions and suggestions of the persons who do not have sufficient formal education.

4.2.4 Longevity or years of selling vegetables

Table 4.4 below shows the distribution of number of years the respondents have been in the handling or selling vegetables. The rationale is to identify the respondents' level of experience in handling vegetables.

Table: 4. 4. Longevity or years of selling vegetables

		Frequency	Percent	Cumulative Percent
Valid	0 - 5 years	117	41.5	41.5
	6 - 10 years	83	29.4	70.9
	11 - 15 years	29	10.3	81.2
	16 -20 years	34	12.1	93.3
	21years +	19	6.7	100.0
	Total	**282**	**100.0**	

Source: Field work, 2021.

Also, the data or result in Table 4.4 above shows the number or years or the years of experiences the respondents have in selling vegetables. The data shows that many of the respondent (4.15%) have been in the

vegetables selling business for the period between 0 - 5 years, 29.4% have been in the business for the period between 6 to 10 years, 10.3% have been in the business for the period between 11-15 years, 12.1% had 16 - 20 years' experience, whereas only 6.7% had been in the vegetable trade for 21 years and over. This result shows that majority of the respondents (58.5%) have been in trade of vegetables for over five years. This suggest that majority of the respondents sampled for this study have some amount of experience and knowledge that are valuable to the outcome of this study.

Food Safety training

Table: 4. 5. Food Safety training

		Frequency	Percent	Cumulative Percent
Have you ever received any training in Food Safety				
Valid Yes		70	24.8	24.8
	No	212	75.2	100
	Total	**282**	**100**	

Source: Field work, 2021

Furthermore, as part of the quest to properly understand the background profile of the respondents, it was imperative to establish whether they have had any training on food safety. The results in table 4.5 depicts that out the total 282, 70 of them representing 24.8% had received some training in Food Safety. In order words, majority (75.2%) of the respondents had never received any form of training in Food Safety. This concurs with the findings of Apanga, Addah, & Sey (2014), Aidoo, Mensah & Yankyera, (2017); Dun-Dery & Addo (2016), that majority of food and vegetable vendors in Ghana do not receive any form of any training in food safety.

Duration of Food Safety Training

Table: 4. 6. Duration of food Safety training

		Frequency	Percent	Cumulative %
When (How long ago) did you receive the training?				
Valid	1-3 years ago,	36	51.4	51.4
	4-6 years ago,	13	18.6	70.0
	7-10 years ago,	7	10.0	80.0
	Over 10 years	2	2.86	82.9
	I do not remember the date	12	17.1	100
	Total	**70**	**100**	

Source: Field work, 2022

This section of the study was answered by only the 70 respondents who affirmed to have receive some amount of food safety training in table 4.5. The data in the table 4.6 above present the duration to which they last received such training. The result from the table suggests that majority (51.4%) of the respondent had food safety training for the period between 1 to 3 years ago. This can be attributed to the outbreak of covid-19 and it accompanying mass education on personal hygiene and food handling. Nevertheless, 18.6% of the respondents affirmed to have received or had food safety training for for the period between 4 to 6 years ago, 10.0% affirmed to such training for the period between 7-10 years ago, only 2.9% had such training 10 years ago and the remaining of 17.1% do not remember the exact year or dates. This result suggests that food safety training is not a frequent occurrence among the vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region.

Health Screening

Table: 4. 7. Health Screening

		Frequency	Percent	Cumulative %
Have you ever received any medical or health screening, or asked to produce reports of anything similar to health or medical screening?				
Valid	Yes	188	66.7	66.7
	No	94	33.3	100
	Total	**282**	**100**	

Source: Field work, 2021.

Additionally, it also was imperative to establish whether the respondents ever in their years of selling vegetables have received any medical or health screening, or asked to produced reports of anything similar to health or medical screening. The results in table 4.7 shows that majority (66.7) of the respondents have had to do medical or health screening, or asked to produced reports of anything similar to health or medical screening, whereas 33.3 of them had not have such experiences before.

Duration of Food Safety Training

Table: 4. 8. Duration of food Safety training

		Frequency	Percent	Cumulative %
If your answer to question 7 is "yes", how often?				
Valid	**Once a while**	**91**	**48.4**	**48.4**
	Yearly	**27**	**14.4**	**62.8**
	One-off event	**51**	**27.1**	**89.9**
	I do not recall	**19**	**10.1**	**100**
	Total	**188**	**100**	

Source: Field work, 2021

Table 4.8 above present the number of times the respondent has received medical or health screening, or asked to produced reports of anything similar to health or medical screening. This section of the study was answered by the 188 respondents who acknowledged to ever received any medical or health screening, or asked to produced reports of anything similar to health or medical screening in table 4.7. From the results in the table 4.8 above, 48.4% of the respondents submitted that they receive medical or health screening, or asked to produced reports of anything similar to health or medical screening once a while, 14.4% submitted that they receive medical or health screening, or asked to produced reports of anything similar to health or medical screening yearly, 27.1% submitted that the medical or health screening was one-off events whereas 10.1% of them do no recall the frequencies or number of times they have received medical or health screening, or asked to produced reports of anything similar to health or medical screening

License, Permits or Documents to Sell Vegetables

Table: 4. 9. License, Permits or Documents to Sell Vegetables

		Frequency	Percent	Cumulative %
Do you have any license, permits or documents that allows you to operate as a vegetable seller?				
Valid	Yes	0	0	0
	No	283	100	100
	Total	**282**	**100**	

Source: Field work, 2021.

Finally, table 4.9 present the results on whether the vegetables sellers in in Agona Market in the Sekyere south district of the Ashanti Region do have any license, permits or documents that allows them to operate as vegetable sellers. From results in table 4.9, all the respondents affirmed not to have any of such license, permits or documents that allows them to operate as a vegetable seller. Ordinarily, per the laws of Ghana, food vendors and handler require permits, license or legal documents to operates (Tuglo, Agordoh, Tekpor, Pan, Agbanyo, & Chu, 2021). However, that has not been the case especially in the rural regions of the Ghana. This concurs with the findings of Tuglo, Agordoh, Tekpor, Pan, Agbanyo, & Chu (2021); Apanga, Addah, & Sey (2014), Aidoo, Mensah & Yankyera, (2017); Dun-Dery & Addo (2016), that majority of food and vegetable vendors in Ghana do have any license, permits or documents that allows to operate as a food and vegetable sellers.

The Hygiene Knowledge of the Vegetable Sellers

This section sought to solicit views from the respondents on their knowledge on Hygiene. The respondents were asked to state their opinion using a five-point likert scale with a range 1=Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree. For each of the statement, mean value and standard deviation was calculated using SPSS program. This study calculated the mean value of each criterion as well as the standard deviation. To interpret the results, the mean values

- Under 2.5 = Insufficient knowledge;
- Between 2.6 and 3.0 = Sufficient knowledge;
- Over 3.0 = Very Sufficient Knowledge.

Also, the results of the mean and standard deviation values as presented in Table 4.10 depicts a fair illustration of the respondents' level of affirmation to each of the statements asked. It also indicates the level of the respondents' knowledge towards vegetables handling hygiene. The standard deviation measures the precise extent or how concentrated the data (observation) vary around the mean; the more concentrated, the smaller the standard deviation.

That notwithstanding, the constructs in table 4.10 is made of thirteen items, only one item recoded a mean score above 3.0 (very significant knowledge), five items recorded the mean score above 2.5 (sufficient knowledge), whereas six items recorded the mean score below 2.5 (insufficient knowledge) level. Ultimately, the whole construct recorded a mean score of 2.44, indicating low or insufficient knowledge on vegetable handling hygiene among the respondents. Table: 4. 10 below present the results.

The variables in Table 4.10 are to test the respondents' level of knowledge regarding vegetable handling hygiene. The table had 13 items, the respondent was asked to indicate their level of agreement or disagreements with of the items. The compositive average of the construct recorded a mean score of 2.44, indicating low level of knowledge on vegetable handling hygiene among the vegetable sellers in Agona market. Nevertheless, the respondents demonstrated appreciable knowledge on some of the variables, one of which included "Washing hands before work reduces the risk of vegetable contamination", this item recorded the highest mean score of 3.55 at the standard deviation of 1.205. There are many factors that could be attributed to this result. It could be the sensitisation dues to the outbreaks of contagious hygiene related diseases like cholera, tuberculosis, chronic diarrhoea, and more recently covid-19. Also, many prior studies have established that hand washing is one of the most common hygiene practises among many food vendors in Ghana (Ghartey & Antwi, 2019; Amegah, Addo, Ashinyo, Fiagbe, Akpanya, Akoriyea & Dubik, 2020; Dajaan, Addo, Luke, Eugenia, Amshawu & Kwasi, 2018; Addo-Tham, Appiah-Brempong, Vampere, Acquah-Gyan & Gyimah Akwasi, 2020; Tutu, Hushie, Asante & Egyakwa- Amusah, 2020), many others found handwashing to be a general hygiene practices among many households in Ghana (Atwine, 2021; Dajaan et al., 2018; Bonful et al., 2020; Oppong et al., 2019; Prah et al., 2018), therefore it not surprising that majority of the responded affirmed their knowledge that washing their hands before touching the vegetable reduces the risk of vegetable contamination.

Table: 4. 10. The Hygiene Knowledge of The Vegetable Sellers

General Vegetable Handling Knowledge	N	Mean	S. D
Washing hands before touching the vegetables reduces the risk of vegetable contamination	282	3.55	1.205
Insects (flies, beetles) and rattles (e.g. mouse) feeding on the vegetables can cause and spread disease	282	2.81	0.112
Contaminated vegetable always has some change in colour, odour or taste.	282	2.69	1.119
Proper cleaning and sanitization of utensils increase the risk of vegetable contamination	282	2.56	1.125
Damaged or rotting fruits and vegetables should be separated and then fresh and safe ones should be washed.	282	2.56	1.154
Using gloves while handling vegetables reduces the risk of vegetable contamination.	282	2.54	1.127
Bloody diarrhoea can be transmitted through poor handling of vegetables.	282	2.49	1.115
Raw vegetables are at higher risk of contamination than undercooked beef	282	2.44	1.177
Freezing vegetables kills all the bacteria that may cause food-borne illness.	282	2.15	1.304
Washing hands with water and soap for 20 s before handling food is important	282	1.96	0.643
The correct temperature for storing vegetable is 5 °C.	282	1.81	0.784
Wiping vegetables with cloths can spread microorganisms	282	1.74	0.97
Composite Average	282	2.44	0.986

Source: Field work, 2021

Furthermore, a significant number of the respondent affirmed that contaminated vegetable always has some change in colour, odour or taste. This item recorded a mean score of 2.69. and a standard deviation of 1.119. Depicting demonstrating sufficient knowledge of the respondent regarding the characteristics contaminated vegetables. This concurs with the findings of a number of studies that some contaminated vegetables do have changes in colour, odour or taste (e.g Alemu, Nega, & Alemu, 2020; Fan, Li, Xue, Zhang & Cheng, 2017; Liu et al., 2018; Miranzadeh et al., 2020).

Other items that recorded a mean score higher than 2.5 (sufficient knowledge level) included "Proper cleaning and sanitization of utensils increase the risk of vegetable contamination" and "Using gloves while handling vegetables reduces the risk of vegetable contamination". These items recorded the mean score of 2.56, and 2.54 respectively, depicting demonstrating sufficient knowledge.

However, a number of the respondent did not know that bloody diarrhoea can be transmitted through poor handling of vegetables, this assertion or item recorded a mean score of less than 2.5 (Insufficient knowledge level) of 2.49. Also, many of the respondent had no knowledge that raw vegetables are at higher risk of contamination than undercooked beef, this is shown by the mean score of 2.44, and finally significant number of the respondent do not have the knowledge that freezing vegetables kills all the bacteria that may cause food-borne illness, this assertion is shown by the mean score of 2.05.

Ultimately, the whole construct under table 4.10 recorded a compositive average or mean of 2.44, depicting low or insufficient hygiene knowledge among the vegetable Sellers in Agona Market in the Sekyere south district of the Ashanti Region. A reliable factor for the low or insufficient hygiene knowledge could be attributed to the education profile of the respondent, as majority (56.0%) of them do not have formal education (see table 4.3).

Practices of Hygiene Among Vegetable Sellers

This section assessed the practices of hygiene among vegetable Sellers in Agona Market in the Sekyere south district of the Ashanti Region. The respondents were asked to state their opinion using a five-point likert scale with a 1=Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree. For each of the statement, mean value and standard deviation was calculated using SPSS program. This study calculated the mean value of each criterion as well as the standard deviation. To interpret the results, the mean values .

- Under 2.5 = Insignificant or less practiced
- Between 2.6 and 3.0 = significant or fairly practiced;
- Over 3.0 = Very significant or frequently practiced

Also, the results of the mean and standard deviation values as presented in Table 4.11 depicts a fair illustration of the respondents' level of affirmation to each of the statements asked. It also indicates the degrees to which the respondents' practice or apply hygiene in handling vegetables. Table: 4. 11 below present the results.

The data in Table 4.11 above presents the results on Hygiene Practices of Among Vegetable Sellers vegetable Sellers in Agona Market in the Sekyere south district of the Ashanti Region. Cumulatively, the data shows high proportion of the vegetable sellers practice good hygiene principle irrespective of their low knowledge on vegetable handling hygiene. This is shown by the composite mean score of 3.0.

Breaking down the result in table 4.11, handwashing recorded the most common hygiene practices among the respondents. Majority of the respondents affirmed that they frequently wash their hands before, during and after handling the vegetables, and also when returning from the washroom. These assertions recorded the mean scores of 3.89 and 3.84, respectively. Handwashing is found to be the most common hyena practices among food vendors and household in Ghana (Ghartey & Antwi, 2019; Amegah, Addo, Ashinyo, Fiagbe, Akpanya, Akoriyea & Dubik, 2020; Dajaan, Addo, Luke, Eugenia, Amshawu & Kwasi, 2018; Addo-Tham, Appiah-Brempong, Vampere, Acquah-Gyan & Gyimah Akwasi, 2020; Tutu, Hushie, Asante & Egyakwa-Amusah, 2020).

Also, a significant majority of the respondent separate bad vegetables from the good ones, to avoid contamination, this sis shown by the mean score of 3.70. More so, slightly higher proportion of the vegetable sellers clean the surfaces and equipment used for storing, handling and preparing the vegetables for sale or storage, check the vegetables every day, and throw the bad ones away, always keep their surrounding environment clean, and wash the vegetables every frequently. These assertions recorded the mean score of 3.62, 3.58, 3.41, and 3.31, respectively. Nonetheless, only few of the vegetable seller disposes off bad or rotten vegetables far away from the market, store their vegetables in the refrigerator or other cool places, and wear gloves when touching the vegetables. These assertions recorded the mean score of 2.44, 1.96 and 1.17, respectively.

Table: 4. 11. Practices of Hygiene Among Vegetable Sellers

Statements	N	Mean	S. D
I frequent wash my hands before, during and after handling the Vegetables	282	3.89	0.895
I wash my hands when returning from the washroom, sneezing, coughing or touching money to avoid contamination	282	3.84	0.781
I separate bad vegetables from the good ones, to avoid Contamination	282	3.70	0.976
I clean surfaces and equipment used for storing, handling and preparing the vegetables for sale or storage	282	3.62	0.813
I check the vegetables every day, and throw the bad ones away	282	3.58	1.089
I always keep my surrounding environment clean	282	3.41	0.944
I wash the vegetables every frequently	282	3.31	0.856
I dispose off bad or rotten vegetables far away from the market	282	2.44	0.813
I store the vegetables in the refrigerator or other cool place	282	1.96	0.932
I wear gloves when touching the vegetables	282	1.17	0.972
Composite Average	282	3.09	0.907

Source: Field work, 2021

As already established, the results in table 4.11 depicts that majority of the vegetable seller in practised good hygiene principles, irrespective of low educational background and poor knowledge on food hygiene. This result contradicts the findings of Chukuezi (2010) and Abdalla et al., (2008), whose separate studies found that despite having minimum level of education and food safety knowledge many of the food vendors did not follow food safety practice and personal hygiene strictly. That notwithstanding, many factors could be attributed the high level of hygiene practices among the vegetable seller. One of such factors is the influence of being in an environment of higher food safety awareness campaigns, most especially within this era of fast spreading contiguous deiseal like Cholera, Ebola, covid-19 etc food and personal has become the responsibility for everyone. Nevertheless, these findings concur with the findings of Oghenekohwo (2015) who asserted that high level awareness leads to higher applications of food hygiene practices among food vendors. The difference in findings of Chukuezi (2010) Abdalla et al., (2008) and Oghenekohwo (2015) could be attributed to environmental influence.

The Environment and Sanitary Conditions of Vegetable Sellers in Agona Market

As parts of the objectives of this study, it was imperative to examine the sanitary conditions of the environment within which the vegetable sellers in Agona Market in the Sekyere south district operate. The views of the respondents were solicited using a questionnaire. The questionnaire is made up of variables that captured wide range environment and Sanitary Conditions. Table 4.12 summarises the results. The results are presented in frequency and percentages

Table: 4. 12. The Environment and Sanitary Conditions of Vegetable Sellers in Agona Market

	Frequency	Percentage
Where do you normally display your vegetables for sale?		
(Indicate in the table below		
Table top	211	74.8
Basket/bowl	44	15.6
Material on ground	16	5.7
Bare ground	11	3.9
Total	**282**	**100.0**
Where do you normally defaecate when you are at the		
market?		
Public toilet	241	85.5
Toilet on the farm premises	0	0.0
Open defecation in the nearby bush	41	14.5
Total	**282**	**100.0**
What is your source of drinking water when working at		
the market?		
Sachet water (pure water)	237	84.0
Bottled mineral water	18	6.4
Piped water	22	7.8
Water from home	1	0.4
Tanker/borehole water	4	1.4
Total	**282**	**100.0**
What sources of water do you use for washing the		
vegetables?		
Piped water	81	28.7
well water	76	27.0
Tanker services	12	4.3
Sachet water	91	32.3
Stream water	22	7.8
Total	**282**	**100.0**
How do you normally store the vegetables before selling		
them?		
In a sack	89	31.6
In a basket	46	16.3
On a table but covered	16	5.7
In an open box	131	46.5
Total	**282**	**100.0**
Are customers happy with the market environment?		
Yes	207	73.4
No	21	7.4
I can't tell	54	19.1

Total	**282**	**100.0**
Are you normally satisfied with refuse collection and management at the market		
Yes	31	11.0
No	240	85.1
I am indifference	11	3.9
Total	**282**	**100.0**
Are you generally satisfied with drainage management at the market?		
Yes	76	27.0
No	98	34.8
I am indifference	108	38.3
Total	**282**	**100.0**

Source: Field work, 2021

The data in table 4.12 present the results on the respondents' perception of the sanitary conditions of their market and immediate environments of which they operate their trade. From the data in the table 12, majority (74.8%) of the vegetable seller in Agona Market operates or display their vegetables on table tops for sale, 15.6% of them display their vegetables in baskets or bowls, about six percent of them display their vegetables in materials on the ground for sale, whereas approximately about four percent of them display their vegetables on bare grounds for sale. This concurs with findings of Angmor (2012) and Oltmans (2013), whose studies established that many food vendors in Ghana operates on table tops. Also, Oltmans (2013) mentioned that there are many instances where food stuffs are displayed or sold on the ground (or bare ground), however these are mainly fresh agro-produce directly from the farms to the market for whole-sale trade. All the same, selling vegetables on table tops is obviously more hygienic than selling on the or bare grounds.

Also from the table 4.13, it was apparent that the Agona market has a Public toilet. This is evident as majority (85.5%) of the respondents confirmed the use of public toilets while at the markets. However, only 14.5% of them resorts to the use of open defecation in the nearby bush. Many studies have established that the lack of public toilets and open defecation constitute crucial challenges in Ghana, especially across the various market squares (e.g Peprah, Baker, Moe, Robb, Wellington, Yakubu & Null, 2015; Osumanu, Kosoe & Ategeeng, 2019; Osumanu & Kosoe, 2013; Mariwah, Hampshire & Owusu-Antwi, 2017; Abudulai, Aziz, Ofori, Adjei, Omer, Yves, ... & Worku, 2021). It is therefore impressive that the Agona market has public toilets that are accessible to all traders and market users. Having decent public toilets is fundamental to promoting or ensuring good sanitary conditions or environment for sustainable hygiene practices.

Furthermore, the results in table 4.12 the vegetable sellers in Agona market had no mean of accessing treated flowing water, as majority (84.0%) of the respondents sampled for this study claim to rely on sachet water (pure water) for drinking while at the market. The rest of them claimed to drink Bottled mineral water (6.4%), Piped water (7.8%), Water from home (0.4%) Tanker/borehole water (1.4%). Treated sachet water (pure water) has been established by many studies as the common sources of portable drinking water in Ghana (Oyelude & Ahenkorah, 2012; Stoler, Tutu, Ahmed, Frimpong & Bello, 2014; Morinville, 2017; Guzman & Stoler, 2018; Mosi, Adadey, Sowah & Yeboah, 2018), therefore it is not surprising that Sachet water (pure water) constituted the most common sources of drinking water for many vegetable setters in the Agona Market of Sekyere south district. Sachet water (pure water) is considered safe, hygienic and affordable, and it is consumed mostly by low and middle-income earners, the perception is that sachet water is of higher quality than tap water (Wardrop et al., 2017).

However, when enquired about the sources of water for washing their vegetables, though many (32.3%) of the respondents still affirmed the use of Sachet water (pure water), relevant number of the respondent uses Piped water (28.7%), well water (27.0%). Also, few of the respondents uses water from Streams (7.8%) and Tanker services (4.3%). This result suggest that a good number of the respondents do use their sources of drinking water

(Sachet water) to wash their vegetables. This could be that Sachet water (pure water) are considered generally expensive than the other sources of water.

In addition, the result is table 4.12 shows that many (46.5%) of the vegetable seller in Agona Market normally store their vegetables in open boxes before selling them, 31.6% stores their vegetables in sacks, 16.3% stores in baskets and 5.7% covers them on tables. The availability of proper storage facilities is essential in ensuring proper food or vegetable hygiene (Chung, 2018; Richter & Bokelmann, 2017; Tirawat, Flick, Merendet, Derens & Laguerre, 2017). Generally, vegetable storage can be undertaken on-farm, at the market or at home; either naturally or mechanically designed facilities like refrigeration - either naturally or mechanically. The type of storage depends on the intrinsic characteristics and perishability of the vegetable. Some vegetables (such as leafy vegetables) may tolerate temperatures close to 0 °C. Others, such as most tropical fruits cannot tolerate exposure to temperatures below 10 °C ((Elik, Yanik, Istanbullu, Guzelsoy, Yavuz & Gogus, 2019; Ardelean, 2018; Khalid et al., 2019; Richter & Bokelmann, 2017; Tirawat, Flick, Merendet, Derens & Laguerre, 2017; Ardelean, 2018).

That notwithstanding, from the results in table 4.12, none of the respondent store their vegetables by means of refrigeration, all of them seem to by the local methods, though a number of scholars and nutritionists have proposed refrigeration and cool temperatures to be the best storage method for many vegetables.

Additionally, the data from table 4.12 suggests that majority (73.4%) of the vegetable sellers believe or have the opinion that their customers happy with the market environment. 7.4% of them do not share that opinion, whereas 19.1 % of them are unbale to state their opion or position on that subject. However, when enquired about their level of satisfaction regarding waste/refuse collection and management at the market, only few (11.0%) of them claimed to be satisfy satisfied with waste/refuse collection and management at the market. Majority (85.1%) of the respondent claimed not to be satisfied with waste/refuse collection and management at the market, whereas 3.9% of them could not state their opinion, position or stands on that subject. Also, regarding the drainage management system of the market, many of respondent where indifference about, thus they could not tell whether they are satisfied or not. However, are good number of the respondents claimed not to be satisfied with drainage management at the market, whereas 27.0 of them were stratifies.

Finally, this section examined the sanitary conditions of the environment within which the vegetable sellers in Agona Market in the Sekyere south district operate. The views from the respondents suggest that though the sanitary conditions of their environment are not hygienic and conductive, however some of the vegetable vendors and customers seem not extremely worried about the situation

The Roles and Measures Put in Place by The District Assembly in Ensuring Food Hygiene Among the Vegetable Sellers

The researcher also gathered data the roles and measures put in place by the district assembly in ensuring food hygiene among the vegetable sellers. The data for this section was collected during an interview section with two senior staff of health and sanitation units of the Sekyere South District Assembly. The data from the interview of the senior staff from the health and sanitation units seems to suggest that the assembly has put in enough measure in keeping proper sanitation in the market. For example, below succinctly highlights the view as expressed by some senior officers of the health and sanitation units of the Sekyere South District Assembly:

> *"The assembly has the duty and responsibility to clean up the market and keep the whole place very hygienic, especially since the market is a place where many people come to buy food stuffs, it is very important the we control waste and sanitation of the market, by checking careless dumping that many leads to many undesirable health consequences, destruction of the environmental, as well as natural disaster like flooding, loss of lives and properties"* (Senior Sanitation and Health Officer, 1).

> *"Of course, we are in charge with the sanitation issues of the market. We are empowered by the district assembly to do so. Among our duties is to make sure that the market is clean, the women and traders do not litre around, surcharge people litre, and we are also to make sure that the market do not become the breeding ground for outbreaks of diseases"* (Senior Sanitation and Health Officer, 2).

The above assertions from the senior officers suggests that the local assembly has the mandate and responsibilities of ensuring good sanitary condition, not only for the vegetable sellers, but for all vendors, traders or users of the

market. It obvious the workers and staff of the health and sanitation units of the district assembly knows the mandate of their outfit, which is significant in achieving the core goals of the organisation or units. Nevertheless, in addition to the responsibilities for ensuring the sanity and hygiene of the markets, the assembly has taken a number of steps or measures to promote food hygiene among food vendor, including vegetable sellers in the market. During the interview, the senior officers of the health and sanitation units of the Sekyere South District Assembly had this to say;

> *food safety or food hygiene has been major concern for this unit, in fact as I earlier mentioned, one of the core objectives for the establishment of this unit is to promote food safety. Therefore, as part of our daily operations we try to offer education the market women, particular those that handles food directly, we try to educate them on food safety, and personal hygiene, handwashing, among many other things. We hold this education section by section due to financial constraints. We also try to enforce strict compliance to the health and food safety laws of Ghana; we conduct regular screening and issue out certificate. We do health and inspections and charge people who fail to comply. We are trying to erect dustbins all around the market, we are still deliberating with the stakeholders in that regard, and I am sure will get started by the close of the year. So, these are some of the measures the district assembly through the health and sanitation department has put in place by to ensuring food hygiene among the food and vegetable sellers in this market.* (Senior Sanitation and Health Officer, 1).

Obviously, the above data suggest that health and sanitation units of the district assembly has instituted measures for ensuring food hygiene among the vegetable sellers in the market. Some of these measures as outlined by the interviewees include, education, enforcement of the sanitation laws, regular health screening, clearing choked gutter and drainage systems, stakeholder consultation among others. Food safety and hygiene education has been found by many studies to one of the most effective methods or measure for promoting food safety and food hygiene (Medeiros, Hillers, Kendall & Mason, 2001; Safari et al., 2017; Soon, Baines & Seaman, 2012; Milton & Mullan, 2010; Kim, Pai, Kang, Kim, Kim, Moon & Ha, 2012; Seaman, 2010; Faremi, Olatubi & Nnabuife, 2018). This is because it is targeted toward changing behaviours that most likely result in foodborne illness. Some of these education focuses on personal hygiene, avoiding cross-contamination, keeping food at safe temperatures, avoiding foods from unsafe sources, and proper hand washing methods (Medeiros, Hillers, Kendall & Mason, 2001).

Also, from the interview, another cogent measure put in place by the units of the district assembly to ensure food hygiene among the vegetable sellers in the market is regular medical screening to trap infected vendors and carriers for treatment. This has also been found by a number of studies to be one of the effective measures for promoting food safety and hygiene (Faremi, Olatubi, & Nnabuife, 2018; Monney, Agyei, Ewoenam, Priscilla & Nyaw, 2014; Ababio, & Lovatt, 2015). This also correspondent with the result is table 4.7 of this study, as majority (66.7%) of the vegetable sellers concurs that they have ever received some medical or health screening, or asked to produced reports of anything similar to health or medical screening.

Conclusion

The findings were based on the study conducted to assess hygiene practices among vegetable sellers in Agona Market in the Sekyere south district of the Ashanti Region. The study revealed that market users lack the requisite knowledge on good hygiene, though they observe good hygiene and sanitation practices. The absence of education on hygiene and sanitation practices, mass screening or health examination, adequate litter bins at the markets may be liked to poor attitudes towards hygiene and sanitation practices (environment and sanitary conditions of the market). Thus, there is an urgent need to educate market users to have the necessary information that will upgrade their food safety knowledge and efficient practices toward improved food hygiene.

Recommendations

Based on the findings of the study, this study sought to make the following recommendations;

1 Sekyere south district of the Ashanti Region need to liaise with the appropriate stakeholders and institutions to develop and implement periodic public education programmes to inform market users about food hygiene, food safety, waste generation and management in order to change their attitudes toward the maintenance of food hygiene in the markets.

2 The government should equip the health and sanitation units of the various MMDAs to fully carried out their mandate.

3 Government should encourage public involvement in policy making about food safety, personal hyenine, waste management and sanitation. People are the hosts of indigenous knowledge and they can come up with various innovations and suggestions that will bring about sustainable ways to promote good hygiene among food vendors in the country

4 As a way to sustain the proper practice of proper hygiene, there should be a system in place (courts) to deter people who will try to sabotage the drive for improved hygiene (particularly on sanitation issues) by imposing some form of sanction commensurate with the offence, ideally a reasonable fine to maintain public order.

5 In order to improve current practices at the market; Sekyere south district of the Ashanti Region has to provide bins separately for biodegradable and non-biodegradable wastes in order to encourage basic sorting for improved sanitation at the market.

Suggesting for Further Research

This research has confirmed most of the findings of previous studies in the field of knowledge, attitudes and practices toward food hygiene, safety and sanitation. However, it also raises relevant questions which provide the need for further research. For instance, it was observed that, many of the vegetable sellers do not good knowledge in food hygiene, yet they practice good food hygiene, though many of them have not ever received any training in food hygiene. In the light of this, it is suggested that studies could be conducted to unearth the possible factors that may lead to scenarios of this nature.

Also, this study was limited to only the vegetable sellers in in Agona Market in the Sekyere south district of the Ashanti Region, therefore, future should many markets from different region, as well as many categories of food handlers across the various regions of the country.

References

Ababio, P. F., & Lovatt, P. (2014). Commercial and institutional caterings food hygiene practice and the 1992 Food and Drugs Act of Ghana, Sections 1, 6 and 7. *Food control, 37,* 73-76.

Abudulai, I., Aziz, T. A. R., Ofori, B., Adjei, G. A., Omer, M. A., Yves, P. S. M., ... & Worku, S. (2021). The Menace of Open Defecation in Ghanaian Communities: The Case of Gambaga and Nalerigu Communities in North East Region. *International Journal of Environmental Protection and Policy*, 9(2), 16-29.

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, 1-7.*

Alemu, G., Nega, M., & Alemu, M. (2020). Parasitic Contamination of fruits and vegetables collected from local markets of Bahir Dar City, Northwest Ethiopia. *Research and reports in tropical medicine, 11,* 17-36.

Amegah, K. E., Addo, H. O., Ashinyo, M. E., Fiagbe, L., Akpanya, S., Akoriyea, S. K., & Dubik, S. D. (2020). Determinants of Hand Hygiene Practice at Critical Times among Food Handlers in Educational Institutions of the Sagnarigu Municipality of Ghana: A Cross-Sectional Study. *Environmental Health Insights*, 14, 1178630220960418.

Amoah, P., Drechsel, P., Abaidoo, R. C., & Ntow, W. J. (2006). Pesticide and pathogen contamination of vegetables in Ghana's urban markets. *Archives of environmental contamination and toxicology,* 50(1), 1-6.

Angmor, E. N. (2012). Can Traditional Markets be improved through transportation service:(The case of Asesewa and Agormanya Traditional Markets, Ghana). International Journal of Academic Research in Business and Social Sciences, 2(6), 366-386.

Apanga, S., Addah, J., & Sey, D. R. (2014). Food safety knowledge and practice of street food vendors in rural Northern Ghana. *Food and Public Health,* 4(3), 99-103.

Atwine, R. (2021). Assessment of the factors associated with status of water and sanitation among households in slums of Bwaise. Unpublished doctoral dissertation, Makerere University.

Case C. (2004). *Preservation of food*. New York: Access excellence at National Museum, Goodness Press; p. 48-72.

Chukuezi, C. O. (2010). Food safety and hyienic practices of street food vendors in Owerri, Nigeria. *Studies in sociology of science,* 1(1), 50-57.

Chung, S. W. (2018). How effective are common household preparations on removing pesticide residues from fruit and vegetables? A review. *Journal of the Science of Food and Agriculture,* 98(8), 2857-2870.

Dajaan, D. S., Addo, H. O., Ojo, L., Amegah, K. E., Loveland, F., Bechala, B. D., & Benjamin, B. B. (2018). Hand washing knowledge and practices among public primary schools in the Kintampo Municipality of Ghana. *Int J Community Med Public Health,* 5(6), 2205-2216.

Dun-Dery, E. J., & Addo, H. O. (2016). Food hygiene awareness, processing and practice among street food vendors in Ghana. *Food and Public Health,* 6(3), 65-74.

Dwumfour-Asare, B., & Agyapong, D. (2014). Food hygiene and safety practices (FHSP) among street food vendors in a low-income urban community of a metropolis in Ghana. *The International Journal of Science and Technoledge*, *2*(5), 38-47.

Fan, Y., Li, H., Xue, Z., Zhang, Q., & Cheng, F. (2017). Accumulation characteristics and potential risk of heavy metals in soil-vegetable system under greenhouse cultivation condition in Northern China. *Ecological engineering, 102,* 367373.

FAO/WHO (Food and Agriculture Organization/World Health Organization). (2008). Benefits and risks of the use of chlorine-containing disinfectants in food production and food processing: report of a joint FAO/WHO expert meeting.

Faremi, F. A., Olatubi, M. I., & Nnabuife, G. C. (2018). Food safety and hygiene practices among food vendors in a Tertiary Educational Institution in South Western Nigeria. *European Journal of Nutrition & Food Safety,* 59-70.

Feglo, P., & Sakyi, K. (2012). Bacterial contamination of street vending food in Kumasi, Ghana. *Journal of Medical and Biomedical Sciences,* 1(1), 1-8.

Ghartey, A. F., & Antwi, B. K. (2019). Hand hygiene practices among street food vendors. *Food and Environment Safety Journal,* 18(2), 34-48.

Karanja, N. N., Njenga, M., Prain, G., Kanga, E., Kironchi, G., Githuku, C., ... & Mutua, G. K. (2009). Assessment of environmental and public health hazards in wastewater used for urban agriculture in Nairobi, Kenya. *Tropical and Subtropical Agroecosystems,* 12(1), 85-97.

Lagerkvist, C. J., Hess, S., Okello, J., Hansson, H., & Karanja, N. (2013). Food health risk perceptions among consumers, farmers, and traders of leafy vegetables in Nairobi. *Food Policy*, *38,* 92-104.

Liu, B. T., Zhang, X. Y., Wan, S. W., Hao, J. J., Jiang, R. D., & Song, F. J. (2018). Characteristics of carbapenem-resistant Enterobacteriaceae in ready-to-eat vegetables in China. *Frontiers in microbiology, 9,* 1147-1161.

Mariwah, S., Hampshire, K., & Owusu-Antwi, C. (2017). Getting a foot on the sanitation ladder: user satisfaction and willingness to pay for improved public toilets in Accra, Ghana. *Journal of Water, Sanitation and Hygiene for Development,* 7(3), 528-534.

Medeiros, L. C., Hillers, V. N., Kendall, P. A., & Mason, A. (2001). Food safety education: what should we be teaching to consumers?. *Journal of Nutrition Education*, 33(2), 108-113.

Milton, A., & Mullan, B. (2010). Consumer food safety education for the domestic environment: a systematic review. *British Food Journal,* 1003-1022.

Miranzadeh Mahabadi, H., Ramroudi, M., Asgharipour, M. R., Rahmani, H. R., & Afyuni, M. (2020). Assessment of heavy metals contamination and the risk of target hazard quotient in some vegetables in Isfahan. *Pollution,* 6(1), 69-78.

Monney, I., Agyei, D., Ewoenam, B. S., Priscilla, C., & Nyaw, S. (2014). Food hygiene and safety practices among street food vendors: an assessment of compliance, institutional and legislative framework in Ghana. *Food and Public Health,* 4(6), 306-315.

Moris, J. R., & Brady, P. L. (2005). *Production and handling practices for safe produce*. Research Report, University of Arkansas.

Mosi, L., Adadey, S. M., Sowah, S. A., & Yeboah, C. (2018). Microbiological assessment of sachet water "pure water" from five regions in Ghana. *AAS open research, 1.*

Oltmans, S. J. (2013). A case study on the food retail environment of Accra, Ghana.

Osumanu, I. K., & Kosoe, E. A. (2013). Where do I answer nature's call? An assessment of accessibility and utilisation of toilet facilities in Wa, Ghana. *Ghana journal of Geography, 5,* 17-31.

Oyelude, E. O., & Ahenkorah, S. (2012). Quality of sachet water and bottled water in Bolgatanga municipality of Ghana. *Research Journal of Applied Science Engineering Technology, 4*(9), 10941098..

Peprah, D., Baker, K. K., Moe, C., Robb, K., Wellington, N. I. I., Yakubu, H., & Null, C. (2015). Public toilets and their customers in low-income Accra, Ghana. *Environment and Urbanization,* 27(2), 589-604.

Pokhrel, P., & Sharma, D. (2016). Study on assessment of food safety knowledge and practices among the street food vendor of urban and semi urban areas of Guwahati, Assam. *International Journal of Home Science,* 2(2), 85-89.

Richter, B., & Bokelmann, W. (2017). Explorative study about the analysis of storing, purchasing and wasting food by using household diaries. *Resources, Conservation and Recycling, 125,* 181-187.

Saeed, H. A., & Hamid, H. H. (2010). Bacteriological and parasitological assessment of food handlers in the Omdurman area of Sudan. *Journal of Microbiology, Immunology and Infection,* 43(1), 70-73.

Safari, Y., Sharafie, K., Karimaei, M., Asadi, F., Ghayebzadeh, M., Motlagh, Z. J., ... & Sharafi, H. (2017). The role of educational intervention in changing knowledge and attitudes of rural homemakers in relation to food safety and hygiene: a case study: iran (2016). *Annals of Tropical Medicine and Public Health,* 10(4), 1024.

Shields, P. M., & Rangarajan, N. (2013). *A playbook for research methods: Integrating conceptual frameworks and project management.* New Forums Press.

Soon, J. M., Baines, R., & Seaman, P. (2012). Meta-analysis of food safety training on hand hygiene knowledge and attitudes among food handlers. *Journal of food protection,* 75(4), 793-804.

Stebbins, R. (2012). Exploratory Research in the Social Sciences. In *Exploratory Research in the Social Sciences,* https://doi.org/10.4135/9781412984249

Stoler, J., Tutu, R. A., Ahmed, H., Frimpong, L. A., & Bello, M. (2014). Sachet water quality and brand reputation in two low-income urban communities in greater Accra, Ghana. *The American journal of tropical medicine and hygiene,* 90(2), 272-278.

Tuglo, L. S., Agordoh, P. D., Tekpor, D., Pan, Z., Agbanyo, G., & Chu, M. (2021). Food safety knowledge, attitude, and hygiene practices of street-cooked food handlers in North Dayi District, Ghana. *Environmental Health and Preventive Medicine*, 26(1), 1-13.

Wardrop, N. A., Dzodzomenyo, M., Aryeetey, G., Hill, A. G., Bain, R. E., & Wright, J. (2017). Estimation of packaged water consumption and associated plastic waste production from household budget surveys. *Environmental Research Letters*, 12(7), 074029.

World Health Organization. (2015). Public health for mass gatherings: key considerations.

Yamane, T. (1967). *Statistics: An introductory analysis* (No. HA29 Y2 1967).

Zu, K. S. A., Wongnaa, C. A., & Appiah, F. (2014). Vegetable handling, distribution and wholesale profitability in "Abinchi" night market, Kumasi-Ghana. *Journal of postharvest technology,* 2(1), 96-106