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Assessment of Microbial Content in some Selected Cooked Foods Sold in UCC Science Market and Amamoma Community and their Negative Health Effect on Humans

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Abstract

Globally, the estimated amount of food found to be contaminated from street vendors particularly in developing countries is on the ascendancy. This study sought to assess the microbial content of some selected cooked food sold in UCC science market and Amamoma community and their negative health effects on humans. A mixed-method approach was adopted. Thus, both qualitative and laboratory work to achieve an in-depth insight into consumer perceptions and vendors' knowledge of the safety of cooked food. The study recruited 7 food vendors and 100 students using purposive sampling method. A structured questionnaire was administered and an observational checklist was used to gather data on the environmental and personal hygiene status of food vendors and also student perception on food related diseases. Data collected were entered into an SPSS version 26.0 software, edited and subsequently used for multivariate analysis. The study revealed that cooked foods sold by vendors in the UCC science market and Amamoma community were unwholesome for human consumption and could be deleterious to the health of consumers. There were statically significant association between contamination of street foods and poor personal hygiene, un-knowledgeable to food borne diseases, improper food handling and illiteracy causing harm to consumers. It is recommended that the Food and Drugs Authority should enforce strict compliance to food quality standards at all food vending establishments in the named cooked food joints.

1. Introduction

Safe food is a basic human right although many foods are over and over contaminated with naturally occurring pathogenic microorganisms **(Amissah & Owusu, 2012; Fung, Wang, & Menon 2018; Lund et al., 2000)**. Access to safe and nutritious food is essential for life and is indeed the foundation for health. In fact, the food market often serves as the commercial and social center of communities, reflecting local culture and traditions of the people. It has been established that the business of food vending has created jobs and contributes significantly to the informal sector of the economies of most countries across the globe and as well resolves serious issues confronting major social problems in less developed countries due to the sector's role of providing inexpensive meals to consumers (**Alimi et al., 2016; Zezza & Abrahale et al., 2019).** Unfortunately, food markets in some cases have also become associated with the spread of a number of emerging diseases. Unsafe food containing harmful bacteria, viruses, parasites or other chemical substances causes more than 200 diseases ranging from diarrhea to cancer. Research made by **Yeleliere et al., (2018)** in Accra and reported that, there were mesophilic bacteria, Bacillus cereus, E. coli, Staphylococcus aureus, Enterobacteriaceae and Shigella sonnei in most ready to eat foods. Similarly, bacteria such as Salmonella species, Staphylococci aureus and Escherichia coli, which can be conveyed by food, cause food poisoning and food-borne illness such as tuberculosis, typhoid fever and cholera **(Abakari et al., 2018).** In particular**, Nyenje et al., (2012**) reported that street sold foods are appreciated for their unique flavors and convenience. Yet, the quality of these street foods cannot be ascertained. Reason is that, in many countries including Ghana, where street food vending is prevalent, there is commonly a lack of information on the incidence of foodborne diseases related to street vending foods. This has resulted in 1 in 10 people in the world falling ill after eating contaminated food and also 420,000 people dying in every year (WHO 2019). Hence, food safety issues have become a global concern.

According to **WHO (2010),** food safety has been proclaimed worldwide and expanding general wellbeing by global offices such as the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). Nevertheless, the specific number of food contamination and foodborne illnesses are not known since most rates are not revealed.

The eating habit of people at the University of Cape Coast community has changed. Almost 70% of the individuals living in the community depend on street vended food for survival which has in other ways provided incomes for people who would otherwise be unemployed.

In Ghana, specifically Cape Coast, the quality of street vended food worth nothing. It appears food vendors have been allowed to operate without any periodic checks to ascertain whether they are practicing good food hygiene. Most foodborne illnesses come about as a result of not handling the food in a hygienic manner. Though, a number of studies have been carried out on microbial quality of cooked foods, yet there is scarcity information on the microbial quality and safety of cooked food served at food joints in UCC science market and Amamoma community. Hence, the present study is timely and provides information on the safety of cooked food sold at the various food joints.

2. Material and methods

2.1 Study Area

This study was conducted at the University of Cape Coast science market and Amamoma community in the Cape Coast Metropolis in the Central Region of Ghana from January 2020 to June 2020. The market is located on the northern campus or the new site of the University of Cape Coast popularly known as science. The market is located just behind the building of College of Agriculture and Natural Sciences of the University and also Amamoma community is just about 1km from the old site. UCC science market is a rectangular building with seven entrances. Three at the southern side of the market and the remaining four at the northern side of the market which both serve as in and exit. The market is adjacent to UCC science taxi rank, opposite to the science block, adjacent to new administration block and opposite to the science welding shop which act as a point source for discharge of effluent through the gutters running through UCC science market. The first entrance from the south, a walking distance from UCC taxi rank is design for selling of cooked food. The second entrance is composed of printing press and cosmetics whiles the last entrance is mainly structured for buying and selling of raw or uncooked foodstuffs.
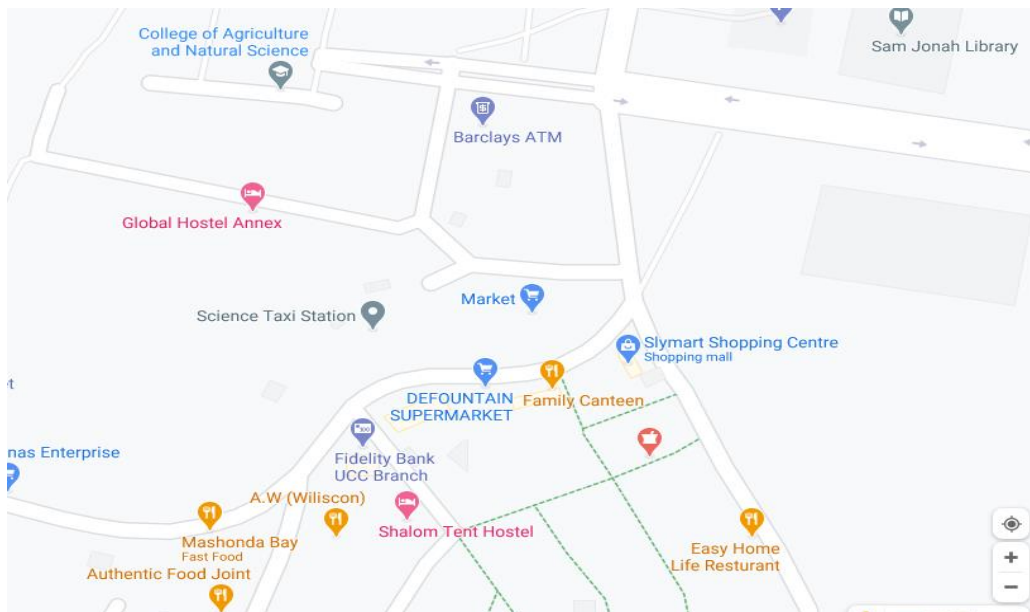

Figure 1 A map showing UCC Science market and Amamoma community

Figure 2 Image of UCC science market.

2. 2Data collection

Assessment of knowledge of vendors on food hygiene and sanitary conditions of cooking environments

Interview guide was designed to obtain information about food handlers' knowledge of food poisoning, personal hygiene, cross contamination, cleaning and, temperature control. Using structured questionnaire, a cross sectional survey was conducted among seven (7) vendors who were purposively selected. A total of seven (7) interview guides with options for further responses were distributed to the vendors since they were in direct contact with the cooking of the food. The questions covered the demographic information of respondents, knowledge of food hygiene and safety practices, kitchen sanitation and medical examination practices of the vendors. The interview guides were self-administered face-to-face by the researcher in order to explain the questions and write out responses (in a language agreed by both parties) as accurately as possible.

Assessment the Perception of Students on Food Related Diseases

A total of 100 people was recruited from the consumer panel. Students were purposively drawn from different Colleges thus; College of Agriculture and Natural Sciences, College of Humanities and Legal Studies, College of Health and Allied Sciences and College of Education) on the basis of gender. Structured questionnaire was administered to students who purchase foods from the selected vendors. The questions included in the questionnaire aimed to assess perception of risks associated with different food-related disease, as well as demographic information of respondents, knowledge and the connection between food consumed and effect on consumers

Microbial Loads Analyses

The seven street food samples were collected in the month of February and March 2020. The food samples were aseptically collected in the market at the point of serving in a clean sterile bowl and immediately stored inside an ice chest with ice packs while transporting them to the laboratory for analysis. Five food joints at UCC science market and two food joints at Amamoma, were chosen for the study. The seven samples were collected at food joints where purchasing was more. Food samples; "Waakye", "Banku", Fried yam, Kenkey, Gari and beans, "Koko" and Roasted plantain, were collected every week and analyzed within an hour of collection.

Isolation and Enumeration of Microorganisms

Microorganisms present in the selected cooked food were analyzed using Brilliant Green Agar for microbiology Sigma Aldrich and Endo Agar (VWR BDH Chemicals, Geldenaaksebaan 464B3001 Leuven Belgium). The media were prepared following manufacturer's procedure. Measurable volume of the media was poured into Petri dishes and allowed to solidify in the laminar flow hood (Cruma EN ISO 9001:2015 Barcelona). The samples were properly homogenized by using a sterile mortar and pestle. 10g of the homogenate sample was added to 40 ml of distilled water in a test tube and diluted. For bacterial isolation, 1.0 ml of dilution from each tube was aseptically pipetted out and plated onto the selective media, thus, Brilliant Green Agar and Endo Agar using spread plate technique. The plating was done in a laminar flow hood (Cruma EN ISO 9001:2015 Barcelona) to maintain aseptic conditions. All the plates were placed in an incubator at 37°C for 16 to 24 hours in an inverted position. This is done to prevent condensation droplet from falling onto the agar surface. For bacterial enumeration the plates were used to determine the number of colonies forming

units (CFU) per gram of food. Enumeration of bacteria and isolation of bacterial colonies were done after incubation using Stuart scientific colony counter.

Statistical Analysis

Data were entered and analyzed using Statistical Package for Social Sciences (IBM SPSS) version 26. Both descriptive and crosstabulation statistical methods were applied.

3. Results

Demographic Information of respondents.

The age range was between 20-45 years and above (Table 1) with majority of the respondents (42 %), being in the age range of 45 and above years while 14.3 % were between 20 and 24 years. Those in the age group ranging from 25 to 29 formed 14.3 % whilst those between 30 to 34 and 40 to 44 years formed 14.3 % of respondents. A reasonable level of education was recorded for the respondents. Table 1 indicates that 42.9 % of respondents attained basic school education, 28.6 % had senior high school education, 14.3 % had tertiary education, and 14.3 % were illiterate.

Table 1 Demographic information of respondents

Variable	Frequency	%
Age (years)		
20-24	1	14.3
25-29	1	14.3
30-34	1	14.3
40-44	1	14.3
45 and above	3	42.9
Total	**7**	**100**
Education level		
Illiterate	1	14.3
Basic school	3	42.9
Senior secondary	2	28.6
Tertiary	1	14.3
Total	**11**	**100**

Food safety knowledge and practices

The result in Table 2 indicates that 100% of respondents had knowledge about food poisoning. However, there were respondents, representing 28.6 %, who did not know that microorganisms could be found in the kitchen environment. Respondents who knew that microorganisms could be found in the kitchen environment were 71.4 % (Table 2). Also, 71.4 % knew that microorganism can cause severe disease whiles 28.6 % had no idea on that. In terms of hand washing, 100 % confirmed that when you touch something during food preparation the hands should be washed. In terms of what needs to be used in hand wiping, most of the respondents (100 %) in the kitchen responded that they wiped their hands with kitchen napkins. With covering of hair, 85.6% of the respondent cover their hair when cooking whiles 14.3% do not. It is noted in Table 2 that all the vendors had medical certiary (100 %).

Table 2 Food Safety Knowledge and Practices

Knowledge about food poisoning	Frequency	%
Yes	7	100.0
No	0	0.0
Total	7	100.0
Knowledge of microorganisms found in the kitchen environment		
Yes	5	71.4
No	2	28.6
Total	7	100.0
Idea on microorganisms causing severe disease		
Yes	5	71.4
No	2	28.6
Total	7	100.0
Number of times hands should be washed during food preparation		
Twice	0	0.0
Three times	0	0.0
When you touch something different from what is being Cooked	7	100.0
Total	7	100.0
Leftover		
Yes	5	71.4
No	2	28.6
Total	7	100
Treatment of leftover		
Leave it on a stove	1	20.0
Discharge	4	80.0
Total	5	100
Source of water		
Running water	6	85.7
Hot water	1	14.28
Total	7	100.0
Possession of medical certificate		
Yes	11	100.0
No	0	0.0
Total	11	100

Table 3 Respondents' knowledge on kitchen sanitation

How often kitchen environment is being cleaned	Frequency	%
Morning	2	28.5
Morning and Afternoon	1	14.3
Morning, afternoon and evening	4	57.1
Total	7	100.0
Disinfecting work surfaces		
Yes	6	85.7
No	1	14.3
Total	11	100.0
Inspection by regulatory bodies		
Yes	7	100.0
Total	7	100.0
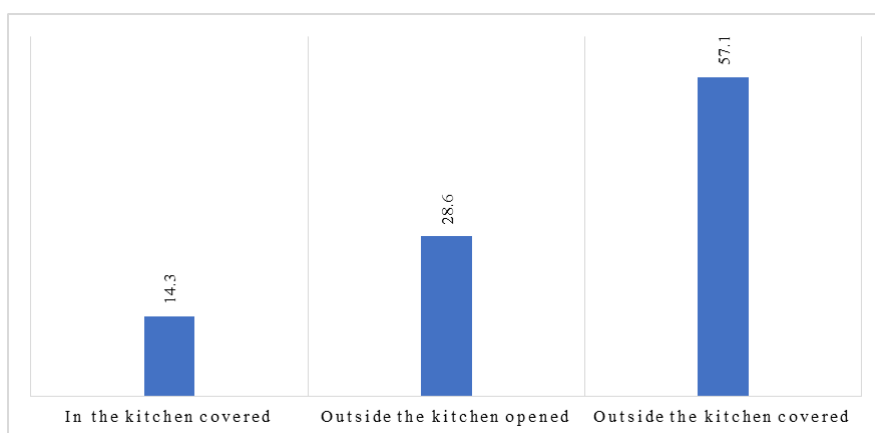
Figure 3 Keeping of dustbins during food preparation

Gender distribution of respondents (student) (n=100)
More than half (54%) of the respondents were male and the rest were female (46%). Over 90% of the respondents were younger than 30 years, with the majority falling with the 18-28year range. The vast majority of respondents, up to 50%, were level 400s, followed by level 300s (27%), level 200s (16%) and 100s at 7% each (Table 4). Less than half (31%) of the respondents were from the college of Agricultural and Natural Sciences. (30%) were from College of Humanity and Ligal Studies, (25%) from College of Education and (14%) from College of Health and Allied Sciences.

Assessing the perception of student on food related disease
Table 5 indicates that, 100% 0f the level 200 student sometimes buy food at UCC science market and Amamoma community. For level 100s, 85.7% sometimes patronize food the above food joint whiles 14.7% do not patronize food at all. For level 300s, 59.3 % sometimes patronize food, 22.2 % do not buy food at all whereas 18.5 always buy food at the food joints. 84 % of the level 400s sometimes buy food, 8.0 % do not buy food at all and 8.0 % always buy food at UCC science market and Amamoma community. Also, 82 % of the level 400 had knowledge on food related disease whiles 18 % had no knowledge on food related disease. 75 % of the level 200 had knowledge whiles 25 % had no knowledge on food related disease. 57.1 % of the level 100 had knowledge whiles 42.9 % had no knowledge on food related disease. However, for level 300, only 40.7 % had knowledge on food related disease with 59.3 % who have no knowledge on food related disease. The difference between the educational

Sanitation knowledge and practices of respondents
Contaminated food preparation surfaces, are just a few of the places where microorganisms can enter food. 85.7 % the respondents disinfected their work surfaces regularly whiles 14.3 % (table 3). It was indicated that over half of respondents (57.1 %) swept the kitchen morning, afternoon and evening. Others (28.5 %) sweep the kitchen only in the morning times and the rest (14.3 %) in the morning and afternoon.

The findings as presented in Figure 2 indicate that over half of respondents (57.1 %) kept their dustbins outside the kitchen covered and 28.6 % of the respondent kept their dustbins outside the kitchen opened. Also, 14.3 % kept their dustbin in the kitchen covered.

level and knowledge on food related disease was significant: p<0.05. Level 400s were more knowledgeable than the other levels. This could be as a result of their educational level. Also, level 100s had more knowledge on food related disease as compared to level 300. This could be as a result of experience and also programme of study.

Table 4 Demographic information of respondents

Variable	Frequency	%
Gender		
Male	54	54.0
Female	46	46.0
Total	**100**	**100.0**
Age (years)		
18-28	95	95.0
29-38	5	5.0
Total	**100**	**100.0**
Level		
100	7	7.0
20	16	16.0
300	27	27.0
400	50	50.0
Total	**100**	**100.0**
Programmes		
College of agricultural and natural sciences	31	31.0
College of education	25	25.0
College of health and allied science	14	14.0
College of humanities and legal studies	30	30.0
Total	**100**	**100.0**

Nexus between food bought at UCC science market and Amamoma community and the negative health impact on humans

From table 6, almost half of the students in all the levels had never experienced any gastrointestinal upset upon eating cooked food from UCC science market or Amamoma. However, 28.6 % of students in level 100 had disorders after eating cooked food from the above food joints. Also, 25.9 %, 14.0 %, and 6.3 % of students in level 300, 400 and 200 respectively had the same experience. 17.6 % had their symptoms right after, 45.1 % had symptoms 3 to 5 hours and 37.3 % at night. With the symptoms, 47.1 % showed symptoms that were not severe, 41.2 5 showed severed symptoms and 11.8 % showed symptoms that were very severe. In terms of treatment, 49 5% went to the hospital, 25.4 % went to the pharmacy, 17.6 % had home treatment and 7.8 % had no treatment.

Table 5 Student perception on food related disease

Variable	Respondents that patronize food at UCC science market and Amamoma				
Level /Programme	Always (%)	Not at all (%)	Sometimes (%)	Total (%)	Inferential statistics
100	0.0	14.3	85.7	100.0	P=0.051, Cramer's V= 0.051
200	0.0	0.0	100.0	100.0	
300	18.5	22,2	59.3	100.0	
400	8.0	8.0	84.0	100.0	
Respondent knowledge on food related disease					
	Yes (%)	No (%)	Total (%)	Inferential statistics	
100	57.1	42.9	100	P=0.002, Cramer's V= 0.002	
200	75.0	25.0	100		
300	40.7	59.3	100		
400	82.0	18.0	100		
Respondent awareness of pathogenic microorganisms found in the environment					
College of Agricultural and Natural Sciences	90.3	9.7	100.0	P=0.042, Cramer's V= 0.042	
College of Education	80.0	20.0	100.0		
College of Health and Allied Science	68.0	32.0	100.0		
College of Humanities and legal studies	100.0	0.0	100.0		
Response on vendors attitude to food contamination					
100	85.7	14.3	100.0	P=0.085, Cramer's V=0.085	
200	50.0	50.0	100.0		
300	56.6	44.4	100.0		
400	67.0	33.0	100.0		

Table 6 Negative impact of food bought on humans

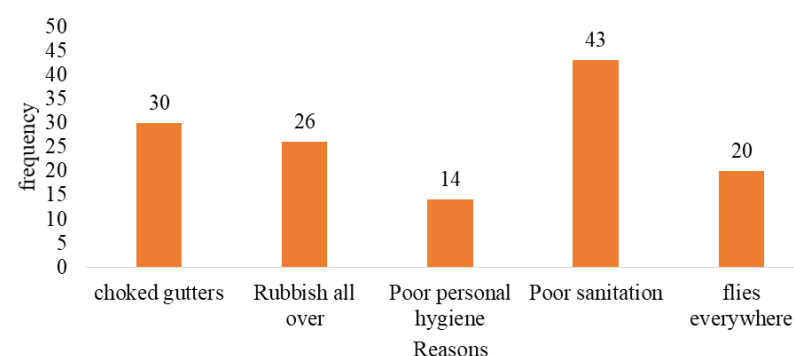| Variable Level	Diarrhea gastrointestinal upset by respondents					Inferential statistics
	Not at all (%)	Yes (%)	Sometimes (%)	Not often (%)	Total (%)	
100	42.9	28.6	0.0	28.6	100.0	P=0.679, Cramer's V=0.679
200	50.0	6.3	2.5	31.3	100.0	
300	40.7	25.9	7.4	25.9	100.0	
400	54.0	14.0	14.0	18.0	100.0	
Time in which respondent showed symptoms						
	Right after (%)	3 to 5 hours later (%)	At night (%)	Total (%)		
100	25.0	25.0	50.0	100.0		P=0.589, Cramer's V=0.589
200	12.5	25.0	65.5	100.0		
300	13.5	52.2	34.8	100.0		
400	17.6	45.1	37.3	100.0		
Severity of illness						
	Not severe (%)	Severe (%)	Very severe (%)	Total (%)		
100	50.0	50.0	0.0	100.0		P=0.811, Cramer's V=0.811
200	62.5	37.5	0.00	100.0		
300	37.5	43.8	18.8	100.0		
400	47.8	39.1	13.0	100.0		
Means of treatment						
	No treatment (%)	Hospital (%)	Pharmacy (%)	Home treatment (%)		
100	25.0	25.0	25.0	25.0		P=0.701, Cramer's V=0.701
200	0.0	50.0	37.5	12.5		
300	0.0	62.5	18.8	18.8		
400	13.0	43.5	26.1	17.4		
Respondents thought on hygienic condition at where cooked food are sold						
Level	Yes (%)	No (%)	Total (%)			
100	42.9	57.1	100.0	P=0.646, V=0.646		Cramer's
200	18.7	82.3	100.0			
300	22.2	77.8	100.0			
400	26.0	74.0	100.0			

Figure 4 Reasons for UCC science market and Amamoma community to unhygienic to sell cooked food

Microbial quality for the food sample.

All the seven food samples were analyzed for microbial loads. The table below describes the result obtained from the microbial analysis.

Food samples

- CFA = "Waakye"
- CFB = Gari and beans
- CFC = "Banku"
- CFD = "Koko"
- CFE = Fried yam
- CFF = Roasted Plantain
- CFG = Kenkey

In analyzing the microbial loads, result showed that there was no growth on the media which was used as a control for all the three weeks. The control was set to confirm the source of the growth. In the first week of analyses, all the samples showed no growth of E. Coli on the Endo Agar. For Salmonella, sample CFA, CFB, CFD, and CFF showed growth which were too numerous to count leaving countable growth on sample CFC and CFG and with no growth on CFE. Comparing it with the Brilliant Green Agar, sample CFA, CFC, CFD, CFE, CFF and CFG showed growth of E. Coli which were too numerous to count leaving no growth on CFB. However, with the Salmonella, no growth occurred on CFB, CFC and CFD leaving too numerous growths on CFA, CFE, CFF and CFG.

Table 7 Result of microbial analysis for week one

Sample	Endo Agar		Brilliant Green Agar	
	E. Coli	Salmonella	E. Coli	Salmonella
CFA	–	TNTC	Clustered	TNTC
CFB	–	TNTC	–	–
CFC	–	7	TNTC	–
CFD	–	TNTC	TNTC	–
CFE	–	–	TNTC	TNTC
CFF	–	TNTC	TNTC	TNTC
CFG	–	16	TNTC	TNTC

TNTC: Too Numerous To Count

Second week

For week two, countable growth of E. Coli was shown on Endo agar for all samples except for CFG which shown no growth. Also, on the same media there were no growth of salmonella for sample CFA, CFB, CFC and CFD. However, sample CFE and CFF showed growth which were too numerous to count where sample CFG showed countable growth of salmonella. Comparing it with the Brilliant Green Agar, it showed uncountable growth of E. Coli for samples CFD but significantly countable growth for sample CFE but not for samples CFA, CFB, CFC, CFF and CFG. On the same media testing for salmonella, showed countable growth on samples CFB, CFE, CFF and CFG but very numerous to count for sample CFA. However, no growth of salmonella was found on the sample CFC and CFD.

Table 8 Result of microbial analysis for week two

Sample	Endo Agar		Brilliant Green Agar	
	E. Coli	Salmonella	E. Coli	Salmonella
CFA	3	–	–	TNTC
CFB	8	–	–	5
CFC	2	–	–	–
CFD	5	–	TNTC	–
CFE	11	TNTC	7	1
CFF	35	TNTC	–	6
CFG	–	2	–	7

Third week

For week three, there were significantly countable growth of E. Coli shown on the Endo Agar for sample CFA and CFG but no countable growth for sample CFB, CFC, CFD, CFE and CFF. Testing for salmonella on the same Agar, there were countable growth of E. Coli for sample CFE and CFF but no countable growth of salmonella for sample CFA, CFB, CFC, CFD and CFG. Comparing it with the Brilliant Green Agar, E. Coli showed a countable growth on sample CFC and CFE but very numerous to count on sample CFB, CFD and CFG. Testing for salmonella on the other hand, there were uncountable growth on sample CFB, CFE and CFG but countable growth on sample CFD. Sample CFC and CFF showed no growth of salmonella on the Brilliant Green Agar.

Table 9 Result of microbial analysis for week three

Sample	Endo Agar		Brilliant Green Agar	
	E. Coli	Salmonella	E. Coli	Salmonella
CFA	4	–	–	–
CFB	–	–	TNTC	TNTC
CFC	–	–	2	–
CFD	–	–	TNTC	18
CFE	–	11	27	TNC
CFF	–	1	–	–
CFG	3	–	TNTC	TNTC

4. Discussion

Assessing knowledge of vendors on food hygiene and sanitary conditions of the cooking environment.

Street foods are integral part of urban life. In many cities worldwide, street vendings are a particularly important source of convenient, affordable food for the urban poor and working classes in both developed and developing countries. Street vending has a major economic impact in many countries and is a major source of employment **(Rahman *et al.,* 2016).** As a consequence of the findings, it was shown that many vendors do have appropriate knowledge to ensure hygienic food handling, such as awareness of pathogenic microorganisms and dangerous food-borne disorders. Even those vendors who had received formal cooking training were unable to translate their expertise

into safe methods. Similar outcomes were obtained by **(Rheinländer *et al.,* 2008).** Also, the vendors' relatively low levels of education showed that it would have an impact on their understanding of proper food handling and hygienic standards. Food poisoning bacteria such as *E. coli*, *Salmonella*, and others were intended to be made more aware of through education of these vendors, as well as the importance of maintaining proper sanitation on their sales premises. The results of this study revealed that the authorities were lax in enforcing this crucial condition for obtaining a license to start and continue a street food vending business.

In addition to the findings in figure 2, a visual inspection of the vending sites revealed that certain food ("waakye") products were sold in the open-air, which was dusty, near drainage gutters, and some near waste bins. Food from the previous day's sale was kept at room temperature and reheated for the next day's sale. The means of conveyance of the meal (roasted plantain), the location of sales, the usage of leaves and newsprint in serving, and how left-over food was preserved were all determined to be likely causes of food contamination and germ growth.

Assessing the perception of students on food-related diseases on food sold in UCC science market and Amamoma community.

The current study discovered a significant relationship between students' degree of knowledge and their program (P 0.05), showing that students had high knowledge of food-related diseases. Table 5 demonstrates that the majority of students (P 0.05) had heard of pathogenic microorganisms, as evidenced by CANS (90.3%), CHAS (68.0%), CE (80%), and CHLS (100%.) More than half of the people polled in this study said they didn't always think about food safety when buying ready-to-eat street food. This suggests that, while being aware of food safety risks, consumers are less concerned about food safety when purchasing street food. A few consumers may be unaware of food safety hazards associated with street vended foods, but the majority of those who were aware were simply unconcerned about food safety when purchasing and consuming street vended foods (**Akinbode *et al.,* 2011**). Consumers who purchase goods from street vendors were generally more concerned with convenience and affordability than with food safety. Despite the fact that more than half of the respondents were aware that eating street vended food can make them unwell, they continued to buy and eat it. Level 400s were more knowledgeable than the other levels. This could be as a result of their educational level and also experience. Also, level 100s had more knowledge on food related disease as compared to level 300. This could be as a result of experience and also programme of study **(Chuang *et al.,* 2021; Lazou *et al.,* 2012; Sanlier & Konaklioglu, 2012)**. The difference between the educational level and knowledge on food related disease was significant: p<0.05. This suggests that an education program should not be limited to microbiology or nutrition, but should address all aspects of product safety in every programme of study. Also, more than half of the student perceived that, vendors attitude contributes a lot to food contamination as most food vendors lack personal hygiene, operate at poor and unhealthy sanitation and also most of the vendors don't show concern about consumers safety. Similar result was produced by **(Rosati & Saba 2004).** However, consumers appear to be unaware that food that looks and tastes good can contain pathogens.

Assessing the nexus between foods sold in the UCC science market and Amamoma community and negative health impact on humans.

According to the findings, nearly half of the students experienced problems after eating cooked food from the UCC science market

and the Amamoma community. Some people experienced severe symptoms, while others experienced mild symptoms. Moreover, over half of the patients were admitted to the hospital, and just a handful of them purchased drugs from the pharmacy, while the rest were treated at home. However, due to a lack of time, students continue to buy food from the above eatery. Also, according to the investigation, the majority of the students (males) do not know how to prepare food and others are too lazy to do so, relying on street vendors to survive, which is always a risk to their lives.

Microbial loads determination

The result obtained showed microbial growth on all the samples selected. The microbes isolated include, *Salmonella sp* and *Escherichia coli*. These microorganisms can be linked to contamination resulted from inappropriate processing, incomplete heating, use of contaminated water during preparation and washing or secondary contamination via contact with contaminated equipment such as chopping boards, knives, and serving wares (**Derbew, Sahle & Endris, 2013).** The contamination could also be attributed to the unplanned and unhygienic conditions in the market. Street food vendors are often unlicensed, untrained in food safety, food hygiene and sanitation, and they work under crude unclean conditions **(Bereda *et al.,* 2016).** Some foods thus, rusted plantain and "waakye" were displayed and sold openly at very dirty and dusty surroundings on the road side. These foods can easily be contaminated by dust. According to **Madueke *et al.,* (2014),** some microorganisms could be found in dust, soil and raw food and can survives normal cooking as a heat resistant spore. The elevated presence and levels may also be linked to contamination from the production source of the raw vegetables used for salads. This detection rate was consistent with the previous study carried out in Tamale, by **Abakari *et al.,* (2018),** which reported finding *E. coli* and *Salmonella sp* in salad samples. The isolated microbes could cause severe health problems like, diarrhea, nausea and abdominal pain, since they are parthenogenic. This occurrence of indicator organisms in the cooked food constitutes a serious threat to the community and the university as well. The results of this study suggest that sanitary handling of street foods, as well as presence of waste close to food preparation and vending premises and absence of standard structures and drainage system could have contributed to the high microbial growth in the food samples.

5. Conclusion

Cooked foods in the University of Cape Coast science and Amamoma have threatening microbial contamination levels. Generally, it was observed that respondents thus both vendors and students were knowledgeable about food safety, hygiene and sanitation. However, most do not put it in practice. As determined in the study, it was revealed that almost all the samples were unacceptable microbiologically and safety levels. There were microbial contaminations in all the foods examined despite the awareness of food hygiene and qualification of the vendors. The contamination levels were above the WHO permissible standard and thus consumption of such foods can endanger the health of the students who patronize these foods. Also, more than half of the consumer had disorder after consuming food from the named food joint. Therefore, to ensure the safety of the foods, producer and hawkers must maintain a clean environment, limit contact with the food samples after production and also maintain a high level of personal hygiene.

For further studies, it is recommended that Similar study should be conducted in UCC Science market and Amamoma community on microbial content of cooked food to ascertain their contamination levels. Also, it is necessary for public health

organizations to be concerned since microorganisms causing food borne hazards and food spoilage can be isolated from raw materials and finished products; thus, reduction of contamination is an achievable policy objective. It is necessary to pay more attention to food hygiene to reduce or eliminate the risk from food borne pathogens; especially those that are originated from street food. Again, strict implementation of food sanitation code and license for street food vendors is needed to make the consumers save. If possible, public health authorities should intensify efforts to monitor conditions of sanitation and hygiene in establishment serving food to the public.

Conflict of Interest

The authors declare no Competing interest.

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