Knowledge, attitude, and food safety practices among food handlers in educational settings in Kampala, Uganda

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Declaration

I GALIWANGO JOVAN registration number 19/U/7581/PS do hereby certify that to the best of my knowledge this research proposal is my original work and that it had never been submitted for any award to any institution of learning. I, therefore, submit it to Makerere University in partial fulfillment of the requirement for the award of a degree of Bachelor of Environmental Health Science.

Sign…  ……

Date……

Supervisor approval

I certify that this research proposal was done under the supervision of the school supervisor for proper support and guidance in this work

School Supervisor

Tonny Sekamatte

Date: 30-09-2022

Acknowledgment

I would like to begin by thanking the almighty God for all the blessings. He has done for me throughout my life, for without Him, I am nothing and I couldn't achieve anything without Him. I would like to thank my supervisor for the guidance that enabled me to achieve this piece of work. I appreciate him for his time and patience. I am also grateful to my whole family especially my brothers, Mr. Kasozi Isaac and Mr. Kabugu Stanley together with my sister Kirabo Precious Ann for the support they gave me financially and through prayers. Finally, I extend my gratitude to my classmates and colleagues who made it possible for me to attain this goal.

Dedication

I dedicate this work to my family members most especially my brothers and sister for their support. I would like in a special way dedicate this work to my mother the late Mbabazi Annet and my father the Late Galiwango Moses for all the things they did for our family, all the love they gave, and mostly all the things they did so that by this time we can access proper and quality education.

Acronyms

FBD	Food Borne Diseases
FSM	Food Safety Management
M.O.H	Ministry of Health
SDGs	Sustainable Development Goals
UBOS	Uganda Bureau of Statistics
UN	United Nations
WHO	World Health Organization

Operational definitions

Food	Includes eat, drinks, chewing gum, and other products of a like nature and substances used as ingredients in the preparation of food or drinks but does not include water, like animals and birds.
Foodborne diseases	Diseases transmitted through food can be either an infection, intoxication, or toxic infection.
Food handlers	Any person who directly handles food packed or unpacked food, food equipment, and utensils, or utensils, or food contact surfaces.
Food safety	Handling, preparing, and storing food in a way to prevent food-borne illnesses. Food safety practices and behavioral partners especially street food vendors.
Personal Hygiene	Is the fact of maintaining the body's cleanliness?
Street food vendors	Any person who prepares and sells food along the streets and other public places.

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Chapter one: Introduction and background

1.1 Introduction

Globally, over 600 million cases and 420,000 deaths occur annually due to the consumption of contaminated food (WHO, 2022). The World Health Organization (WHO) indicated that 1 in 10 individuals worldwide suffered from food-borne illnesses in 2015 (Franz et al., 2019). It's estimated that over 92 million people in Africa suffer from food-borne illnesses while 137,000 die due to food-borne infections annually (Bisholo et al., 2018). The consumption of contaminated food is associated with a 70% increment in diarrheal diseases (Rahman et al., 2016). Indeed, more than 220 million cases and 96,000 diarrhea deaths among children are attributed to the consumption of contaminated food. Other groups gravely impacted by the consumption of contaminated include pregnant women, the elderly, and those with underlying conditions (Majowicz et al., 2014). A study carried out to assess the prevalence of self-reported food-borne illness among college students indicated that 28.6% of respondents self-reported that they have been sick due to food-borne illness within a year.10.1% sought medical attention, and 3.2% reported a suspected food-borne illness.30.8% and 29.8%, respectively, avoided particular restaurants or foods for fear of food-borne illness (Lyonga et al., 2010). Morbidity and mortality arising from food consumption are linked to poor handling practices (Bisholo et al., 2018). Although data on the hygiene of food handlers are insufficient, a microbial assessment conducted among food handlers in Malaysia indicated that 48% of food handlers had salmonella in their hands (Lee et al., 2017).

WHO defines food safety as measures that are put in place during the production, processing preparation, distribution, and storage of food to prevent it from contamination and thus, make it fit for human consumption (WHO, 2022). Food contamination can be classified as physical, microbiological, or chemical. Microbiological contamination occurs when food has been contaminated with microorganisms like fungi, bacteria, toxins, and viruses. Prevention of microbial contamination is essential to decrease the rate of food-borne diseases and this can be done through cleaning and sanitization. Physical contamination occurs when food is contaminated by a foreign object during its production for example fingernails, stones, metals, or pieces of cooking materials. Chemical contamination occurs when food gets contaminated by some type of chemical for example chemicals used in cleaning the kitchen. Chemicals should be properly labeled and stored separately for foodstuff to minimize the risk of contamination.

Food handlers, defined in this study as anyone who either handles food or touches surfaces that are likely to be in contact with food such as plates, bowls, and cutlery play a critical role in advancing food safety in educational settings. During the preparation of food, the food handlers play a key role in hygienic sanitary control and may be responsible for the promotion of foodborne illness (Guillier et al., 2011). According to WHO, FBDs in developing countries are high because of bad hygienic practices, food handling methods, and weak food safety regulatory systems. Most of the food handlers in developing areas don't demonstrate a corresponding positive behavior towards food hygiene practices (Clayton et al., 2002). While educational settings are characterized by students who have low food safety awareness and practices (Azanaw et al., 2021). Studies have reported that students especially between the age of 18 to 29 tend to have a belief in higher immunity so they take up the concept of food safety lightly. Moreover, they tend to cook for themselves and their colleagues (roommates or friends) yet they possess no appropriate training or certifications for those who take catering services as a part-time job. This has resulted in a high number of food-borne illness among students and poposes high economic burden during treatments (Osaili et al., 2021).

However, food is handled by a lot many different people which makes food easily contaminated whether accidentally or deliberately. This can threaten life by endangering the health of people who consume that food and later cause high repercussions in a country like Uganda. Over 97% of illness cases reported are due to food poisoning caused by improper handling of foods by people involved in catering services (Gaungoo and Jeewon, 2013). Foodborne illness is a major issue of public health importance since many people get from consuming contaminated food and this has later imposed a high economic burden on society. Foodborne illnesses are not only associated with microbiological pathogens as mentioned above but they can be brought about by chemical contaminants that could be made during processing, packaging, and storage. Others are got from the environment like toxic metals, and pesticides (Choudhury et al., 2022). Toxic metals have a big effect on the body systems like the nervous system and other systems, that impose a threat to people who consume them (Shukla and Singhal, 1984). Among the most prevalent pathogens that cause food contamination are shigella, salmonella, listeria, Escherichia Coli, and Entamoeba histolytica, and these when ingested they cause foodborne illness (FBD) in people.

1.2 Background

Food safety has become one of the ten threats to global health in the year 2019 and the outbreak of foodborne illnesses is more noticeable in developing countries. Over 20% to 40% of diseases globally are associated with the consumption of contaminated food (Odipe et al., 2019). In Uganda as a developing country, both public and private institutions, often have food services or catering units inside or outside the campus, where meals are served to students. (Henson and Jaffee, 2008). To prevent an outbreak of food-borne diseases in these institutions, high standards of hygienic and safety practices by the food handlers are essential. Although institutional food handlers may possess the required knowledge and skills needed in food safety practice, errors due to human handling are often cited in several Food Borne Disease outbreaks (Sani and Siow, 2014).

Most of the food handlers in developing areas don't demonstrate a corresponding positive behavior towards food hygiene practices (Clayton et al., 2002). Over 97% of illness cases reported are due to food poisoning caused by improper handling of foods by people involved in catering services (Gaungoo and Jeewon, 2013). Students from different institutions get their food mostly from the streets, a few from designated places inside, and most of them outside campus from food vendors (Austin et al., 2005). Vended foods are foods that are made usually on the streets and are ready to be eaten immediately without further preparation. (Amare et al., 2019) Several interventions have been put in place by the government and other development partners, including sensitization of food handlers on basic food hygiene and safety practices such as hand washing with soap at critical points, and inspection of eating places. However, gaps still exist in terms of knowledge, attitudes, and practices among food handlers.

Inadequate food hygiene and safety management as well as deficiencies in most parameters of environmental sanitation contribute to the high morbidity and frequent outbreaks of food-borne diseases which is detrimental to the health of students. Therefore, this research will help us understand better the levels of knowledge, attitudes, and practices regarding food safety among food handlers and provide baseline information that will help guide the type of intervention that is needed to preserve good food safety management.

Chapter two: Literature review

2.1 Food handler's knowledge regarding food safety management

Studies carried out in Africa especially in the Sub-Saharan region reveal that the odds of having good food handling practices are almost twice higher among food handlers who had good food safety knowledge than those who have poor knowledge (Tadege Alemayehu et al., 2021) making knowledge a key influencing factor towards food handling practices. A cross-sectional study conducted among 29 institutional food handlers about being knowledgeable about hygienic practices, cleaning, and sanitation procedures in Ghana indicated that 76.2% of food handlers did not know that Salmonella is a foodborne pathogen and 70.6% did not know that hepatitis A is a foodborne pathogen. However, about 88% agreed that bloody diarrhea is transmitted by food. Therefore, a few of the food handlers had some satisfactory knowledge concerning food safety but it was not put into action during processing and food handling (Akabanda et al., 2017).

An organizational-based cross-sectional study made amongst food handlers in areas like Suraram indicated that over 82.5% were not certified in food training, and only 27.9% of food handlers reported that they heard about food-borne diseases (Kubde et al., 2016). The study conducted at the University Kebangsaan Malaysia concerning knowledge of food handlers indicated that food handlers most especially the street vendors did not have knowledge concerning food hygiene and safety which in turn imposed high risks of foodborne diseases which imposed a global threat to the world and therefore, effective and on-going training on food service employees should be done to ensure the safety of food provided (Sani and Siow, 2014). A study carried out to assess food safety knowledge of food vendors in higher institutions of learning in Bauchi state Nigeria showed that increasing age, literacy, and an increasing number of years of education were the statistically significant determinant of increasing the food safety knowledge of the food vendors (Madaki and Bavorova, 2019).

2.2 Attitudes towards food safety

A longitudinal evaluation of food safety knowledge and attitudes among food handlers in Ontario school settings indicated that at the baseline of the evaluation, knowledge, and attitude were poor among food handlers (Majowicz et al., 2017). Research to investigate how food handlers' attitudes may change, following training could translate into reduced food-borne disease risk is warranted.

In a study conducted at Makerere university food service people, all people who participated in the study understood food hygiene practices and had negative responses towards food safety and hygiene attitudes (BALUKA et al., 2015).

2.3 Practices toward food safety

A study conducted in Nigeria regarding food safety and hygienic practices of street food vendors indicated as a majority of the respondents had a good level of knowledge (81%) and positive attitude (71%) about food hygiene, but only 37% of the respondents had a good level of hygienic practice. It was revealed that only 32% and 46% of the respondents received training in food hygiene and environmental health worker. (Chukuezi, 2010)

In a study carried out in Takoradi metropolis Ghana demonstrating basic knowledge and practices of food safety, 34 fast food operators were selected through a stratified random sampling technique indicated that 85.3% of them understood kitchen hygiene to be the cleaning of the kitchen and its equipment while 14.7% of them understood it to be sweeping the kitchen.85.3% said they cleaned their service area after a day's work, 8.8% did the cleaning daily every morning before they started working and only 5.9% were cleaning weekly. Concerning food hygiene practices, workers were aware of hygienic practices like cleaning utensils, washing raw vegetables, personal hygiene, kitchen hygiene, and hand washing but did not adhere to these activities (Amoah et al., 2018). An investigation concerning food practices of food handlers and to assess the sanitary conditions of Attieke production units in the south of cote d'Ivoire showed that the hygienic condition and practices of food handlers were inadequate (Djéni et al., 2014).

A community-based cross-sectional study design that was conducted in Batu town Ethiopia amongst 302 food handlers who were working in 151 public food establishments, showed that over 47% of the study respondents had poor food safety practices (Arero and Abe, 2021). A study concerning general hygiene and sanitary practices of street food vendors in Nigeria where 110 random samples of street food vendors were got indicated that food vendors lacked training on hygiene, 2.7% had formal training on food preparation.60% of the respondents prepared foods in an unkempt environment where flies were around the foods which were going to be consumed by people (Nurudeen et al., 2014).In general, poor food hygiene knowledge and frequent engagement in unsafe food handling practices led to foodborne illness. The above studies indicate that food safety was low therefore further studies are needed.

Chapter three: Problem statement, justification, conceptual framework, and research questions

3.1 Problem statement

Poor food safety practices among food handlers remain a significant public health challenge, especially in educational settings in Uganda. Food preparation in educational settings in Kampala is characterized by the use of dirty equipment, an unsanitary working environment, improper food storage, and poor hygiene among food handlers including wearing dirty uniforms or aprons, and long fingernails. Street foods such as chapatis, sausages, and salads which are a common delicacy among students in Kampala are contaminated with E Coli (Kabwama et al., 2017, Ronoh et al., 2020), which is a common agent for foodborne illnesses. Unsafe food handling practices pose a high risk of food contamination thereby leading to foodborne illnesses such as typhoid, diarrhea, dysentery, and campylobacteriosis. Makerere University, my study setting, is surrounded by slums that are known for foodborne disease outbreaks (Kabwama et al., 2017). These foodborne outbreaks could be attributed to a negative attitude and inadequate knowledge of safe food handling practices among food handlers. Due to the high risk of foodborne illnesses emanating from poor food handling practices, students in educational settings in Kampala suffer from a high economic burden or financial losses when treating these illnesses, and poor academic performances because of loss of time in their education. Despite the negative impacts of unsafe food practices on students' health and well-being, there is limited evidence of knowledge, attitudes, and safety practices among food handlers in educational settings in Kampala. Therefore, this study aims to establish knowledge, attitudes, and food safety-related practices among food handlers in educational settings.

3.2 Justification

The food handlers in a commercial food establishment in university settings need to have acceptable knowledge, proper attitudes, and good hygienic practices when handling and preparing food. The study will provide adequate information that could be used by health service providers like the local government to develop minimum operation standards for food handlers. The study will provide information that will sensitize food handlers regarding food safety management and in this case, foodborne illness transmission will be reduced in an educational setting enabling good health and well-being of people.

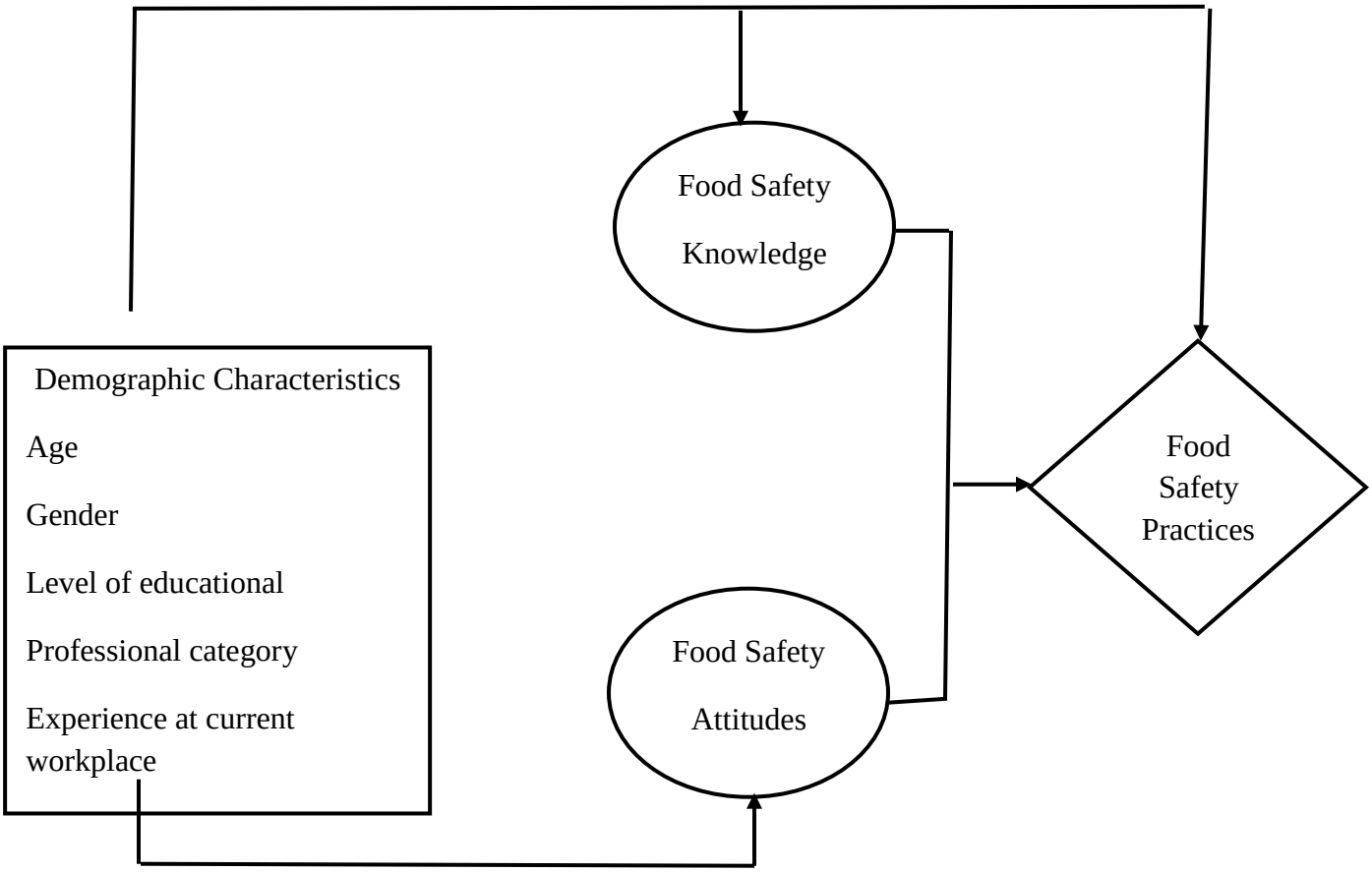

Figure 1: Conceptual framework for the relationships between demographic characteristics and food handlers' knowledge, attitude, and practice regarding food safety.

Narrative

This conceptual framework shows the relationship between the dependent variable and the independent variables. It mainly has three domains (knowledge, Attitude, and Practice) concerning predictor variables (demographic factors). The figure (fig 1) illustrates the relationships between demographic characteristics and food handlers' knowledge, attitude, and practice regarding food safety. Socio-demographic characteristics such as work experience, and the level of one's education influence knowledge, attitude, and food safety practices. The knowledge, attitudes, and practices of food handlers regarding food safety are very crucial if foodborne diseases are to be successfully eliminated among people, especially in educational settings. Proper knowledge about food safety influences the attitudes and perceptions of people especially students in educational settings and food handlers towards food safety. Both good knowledge and positive

attitudes toward food safety enable positive practice measures to be taken in advance to prevent dangers of food unsafety to occur.

3.3 Research questions

1) What is the level of knowledge of food safety among food handlers in educational settings in Kampala, Uganda?
2) What is the attitude towards food safety among food handlers in educational settings in Kampala, Uganda?
3) What is the food safety-related practice among food handlers in educational settings in Kampala, Uganda?

Chapter four: Study objectives

4.1 Objectives of the study

4.1.1 Broad objective

To assess the level of knowledge, attitudes, and food safety practices among food handlers in educational settings in Kampala, Uganda

4.1.2 Specific objectives

1) To establish the level of knowledge of food safety among food handlers in educational settings in Kampala, Uganda
2) To establish an attitude towards food safety among food handlers in educational settings in Kampala, Uganda
3) To establish food safety-related practices among food handlers in educational settings in Kampala, Uganda

Chapter five: Methodology

5.1 Study area

The study was conducted around Makerere University's main campus branch which is located in the Kampala district and sited on over 300 acres of land. The institution is composed of nine colleges and several schools offering programs for about 36,000 undergraduates and 4,000 postgraduates. As directed by the University Council, only a few contracted food establishments were authorized to sell food to both students and lecturers and the rest of the people go outside campus to get food. Over 3000 students get food from around campus and these include the Kikumi-Kikumi area, where food is sold at a cheaper price, Kikoni view, which mostly targets hostel and rental students, and Mulago view area where most of the medical students get food from, and Wandegeya food spot where restaurants are mostly found.

Figure 2: Map showing the location of Makerere University

5.2 Study design

A mixed-method cross-sectional study design was used. Quantitative data collection methods were used to obtain data on food safety practices and behaviors that are associated with the control of foodborne illness risk factors. Qualitative methods were used to understand the food handler's role in food safety management and assess the level

5.3 Study populations

The study was conducted among food handlers working in commercial food establishments in education settings in Kampala, Uganda.

5.4 Sample size

Sample size determination was done using this Leslie Kish formula (Kish, 1965).

$$N= z^2 P Q/ d^2$$

where N is the sample size, Z is the standard deviate at a 95% confidence interval, taken as 1.96, and P is the proportion of food handlers who are knowledgeable about food safety management in food establishments like restaurants in this case will be 70% (0.70) (Al-Kandari et al., 2019). Q is the proportion of food handlers who are not knowledgeable about food hygiene(1-P), and d is the precision which is at 5%. This yields an estimated sample size of 322 food handlers.

5.8 Sample size for the qualitative component

Eight (8) key informant interviews were conducted. Qualitative data collection is conducted up to the point where no new information will be coming up (theoretical saturation).

5.9 Sampling procedure

Multi-stage sampling technique was employed. First, a list of food commercial establishments was obtained from Kampala Capital City Authority (KCCA), Department of Public Health Services and Environment where food establishments around Makerere University are sorted out. Secondly, a simple systematic sampling was used where a list of food establishments was used as a sampling frame and considered every second food establishment to sample. The starting value was obtained by simple random sampling by tossing a coin where the head represented an even number and the tail represented an odd number until the required sample size is achieved. Within the selected food establishment, food handlers were obtained through simple random sampling by lottery method. Here, all names of the food handlers were written on paper which is drawn from a small box or cup. In case the selected food handler did not consent to participate in the study, the next consenting participant within the same food establishment was included in the study. Key Informants were purposively selected based on their knowledge about food safety and these included food establishment managers, owners, and chefs

5.10 Eligibility criteria

Inclusion criteria	Exclusion criteria
✦ All restaurants around the selected universities in Kampala ✦ All cooks and waiters and waitresses in those restaurants. ✦ Managers of those restaurants ✦ All street vendors and mobile street vendors operate in selected university settings.	✦ All food handlers that are not willing to participate ✦ Food handlers will consent to be part of the study but will be absent during data collection. ✦ Food handlers who asked for money to participate in the study ✦ Those food handlers with unsound minds.

5.11 Measurement of study variables

5.11.1 Dependent variables:

5.11.2 Measurement of knowledge of food safety

A total of two questions were used to determine the knowledge of food safety among food handlers. A total knowledge score for each question was got by adding scores for each question. The maximum total score was 3.0 and the minimum score was 0.0

No.	Knowledge statement	Response and score
1.	How do you know the food you have received is free from diseases	Presence of stamp=1, When it looks cleans =1, I don't know=0 and Others=0
2.	Surfaces and equipment should be clean before re-using for food processing	Yes=1, No=0

5.11.3 Measurement of attitudes towards food safety

A total of 26 questions were used to determine attitudes regarding food safety among food handlers. Food handlers are asked; (1) Food handlers with wounds, bruises or injuries on their hands must not touch or handler food (agree=1, disagree=0); (2) Using watches, earrings and rings will increase the risk of food contamination (agree=1,disagree=0); (3) Improper food storage is dangerous to health (agree=1,disagree=0); (4) Hand washing before handling food reduces the risk of contamination (agree=1,disagree=0); (5) Regular training could improve food safety and hygiene practices (agree=1,disagree=0) (6) Safe food handling to avoid contamination and diseases is part of food handler job responsibilities (agree=1,disagree=0); (7) Keeping working

surfaces and utensils clean reduces the risk of illness (agree=1, disagree=0); (8) Using different knives and cutting boards for different foods is worth (agree=0,disagree=1); (9) Its unsafe to leave food out of the refrigerator for more than 2 hours (agree=1,disagree=0), (10) Inspecting food for freshness and wholesomeness is valuable (agree=1,disagree=0), (11) After processing food, any leftovers should be kept in a cool place (agree=1,disagree=0), (12) Raw foods are healthier and nutritious than cooked (agree=1,disagree=0), (13) Knives, hooks and cutting boards can be a source of food contamination (agree=1,disagree=0), (14) Knives and cutting boards should be properly sanitized to prevent cross contamination(agree=1, disagree=0), (15) The same towel can be used to clean many places (agree=0,disagree=1), (16) Sneezing or coughing without covering our noses or mouth could contaminate the food (agree=1,disagree=0), (17) Wearing protective clothing and shoes could help improve work safety and hygiene practices (agree=1, disagree=0), (18) Putting on hair cover on the head is a good practice in food industry (agree=1, disagree=0), (19) It's important to use potable water to wash working surfaces and cutting tools after disinfection (agree=1,disagree=0), (20) Changing or sterilizing the cutlery in between food processing could limit cross contamination of food (agree=1,disagree=0), (21) Food handlers can get ill if they have contact only with the blood of animals during work activity (agree=0, disagree=1), (22) Food handlers can only contaminate food when they are ill (agree=0,disagree=1), (23) Having a stomach ache would stop someone from working in the food establishment (agree=0,disagree=1), (24) Having a wound would stop someone from working in the food establishment (agree=0,disagree=1), (25) Having a family member suffering from diarrhea and vomiting would stop someone from working in the food establishment (agree=0. disagree=1), (26) Food handlers can contaminate food through handling, coughing and sneezing (agree=1, disagree=0) The maximum total scores a respondent was to attain was 26.0 while the minimum was 0.

5.11.4 Measurement of food safety-related practices

A total of 5 questions were used to determine the practices being done by the food handlers and they are asked the following questions; (1) What protective wear do you have? Observe and circle all that apply (Head gear, White overcoat, Gumboots, and any other=1, no wear=0,); (2) Is the head gear visibly clean (yes=1, no=0); (3) Is the white overcoat visibly clean (yes=0, no=1); (4) Are the boots visibly clean (No=1, yes=0); (5) Do you have a separate knife for serving these

different types of foods (yes=1, no=0). The maximum practice score was 7.0 and the minimum was 0.

5.11.5 Independent variables

These included socio-demographics, such as level of education, work experience, and age. Age was collected as a continuous variable and measured in terms of years, work experience was measured as the period (years or months) one has spent in a food handling business or job. Level of education was categorized as primary, secondary, degree, and none (no education).

5.12 Data collection methods and tools

Structured interviews: In this research carried out, both quantitative and qualitative data collection tools were employed. Structured interviews guided by a questionnaire was used to collect quantitative data while a key informant interview guide was used to collect qualitative data. The questionnaires were divided into four parts i.e. 1) socio-demographic characteristics, 2) knowledge of food safety, 3) attitudes towards food safety practices and 4) food safety practices. This enabled me to measure knowledge and practices through questionnaires and attitudes are measured through a face-to-face interview.

Observations

Direct observations were done following a structured observation checklist. The observation checklist was used to investigate the availability of license on the premises, describe the type of structure, describe the materials it's made of, the state of cleanliness, lighting, and ventilation in the food establishment, and then look out for handwashing facilities, adequate and wholesome water in the premises, sanitary facilities, look for evidence of any vector in the food premises, the dress code of food handlers, and check whether they have open wounds.

Key Informant Interviews

The interviews were conducted with different personnel having experience and knowledge of food safety management using a key informant interview guide. Key informants were selected purposively at the food establishment and these include managers, food chefs, and food establishment owners. Notes are taken and audio recordings were done using a smartphone during the interviews with their consent. Key informant interview guide addressed to the food establishment owners, managers, and chefs.

5.13 Data management and analysis

5.13.1 Quantitative data management and analysis

Quantitative data were edited for consistency and omissions, data entry is done using a mobile data collection software (Kobo collect) and then transferred to STATA version 14 and SPSS for data cleaning and statistical analysis. The univariate analysis was done to determine means and frequencies and the results are summarized in tables and graphs.

5.13.2 Qualitative data management and analysis

Kept copies of my information through the use of a backup system. Backups updates were made as data preparation and analysis proceeded. Arranged field notes in a chronological schema. Created a system for labeling and storing interviews. This included a unique file name or case identifier for each file that communicates crucial information to the researcher. Cataloged all documents, provided safe storage of all materials, and checked for missing data. During qualitative data analysis, the researcher prepared and organized data by printing out transcripts, gathered field notes, and documents, and marked their source. The researcher also took notes of any demographics theories critical in understanding the study results. This was followed by the review of transcripts. An inductive approach was used during the coding process where the dataset was broken into smaller samples, created and applied codes that covered the sample. Read a new sample of data, applied the codes created for the first sample and where codes do not match or where additional codes are needed, new codes were created based on the second sample until I had coded all the data. After the coding process, the researcher organized the qualitative codes into emerging themes and subthemes.

5.14 Ethical consideration

An introductory letter was obtained from Makerere University School of Public Health that was presented to the office of the town clerk in Kampala city, seeking authorization for the study in the area. During the study, consent was sought from each respondent, and before the start of data collection, the researcher explains to the participant's purpose and objective of the study. Questionnaires were administered and participants were assured of the confidentiality of the information they give their participation is voluntary as their participation attracts remunerations. The interviews were conducted during day hours and took about 15 to 30 minutes. Participants were informed that their decision to participate or decline participation would not affect any

benefits or services received by them. Written consent was obtained from literate respondents and participants who are unable to read and write, their thumbprints are obtained.

Dissemination of results

Results were disseminated to Makerere University School of Public Health in a dissertation in partial fulfillment for the award of a bachelor's degree in Environmental Health Sciences and copies of the results are availed to Kampala City Council Authority (KCCA) for purposes of planning and sustainable interventions on an issue pertaining food safety.

Chapter six: Results

6.1 Social demographic characteristics of the food handlers

The study enrolled 326 food handlers. About 68.4% (223/326) of the respondents were females, and 45.1% (147/326) were aged between 25 to 30 years. The majority, 72.4% (236/326) of the respondents had attained a secondary level of education,8.3% (27/326) had tertiary education,16.9% (55/326) had primary education and 2.5% (8/326) had no formal education. 75.8% (247/326) were single, and Catholics were 38.7% (126/326). About 84.7% (276/326) were working in food establishments owned by other people, 4.3% (14/326) had joint ownership, and 11% (36/326) owned by operation in the food establishment. The majority of food handlers (98.8%) (322/326) were regularly employed and 1.2% (4/326) partly worked in the food establishment. Most of the food handlers worked in the food establishment for about 1 to 5 years (90.5%) (295/326), 8% (26/326) worked from 6 to 10 years and 1.5% (5/326) worked for more than 10 years (Table 1).

Table 1: Socio-demographic characteristics among food handlers in educational settings in Kampala, Uganda

Variable	Response	Frequency (N=326)	Percentage (%)
Sex	Female	223	68.4
	Male	103	31.6
Age category	18-24 years	141	43.3
	25-30 years	147	45.1
	Above 30 years	38	11.7
High education level	Secondary	236	72.4
	None	8	2.5
	Primary	55	16.9
	Tertiary	27	8.3
Marital status	Divorced	3	0.9
	Married	62	19.0
	Separated	8	2.5
	Single	247	75.8
	Widower	6	1.8
Religion	Catholic	126	38.7
	Others (specify)	18	5.5
	Protestant	125	38.3
	Muslim	57	17.5
Ownership	Joint ownership	14	4.3
	Owned by another person	276	84.7

	Owned by operator	36	11.0
Regularly employed	No	4	1.2
	Yes	322	98.8
Years worked in the food establishment	1-5 years	295	90.5
	6-10 years	26	8.0
	above 10 years	5	1.5

6.2 Status of food preparation premises

Less than half (41.7%) (136/326) had valid licenses and 18.4% (60/326) had no licenses on the premise. About 4% (13/326) of respondents operated in temporary structures, and 68.1% (222/326) of respondents had back-to-back ventilation in the rooms of operation. Nearly all food premises (97.2%) (317/326) had a hand washing facility, about 3.2% (10/326) had no mechanism that prevented recontamination after washing and 15.5% (49/326) had poor drainage for water from a hand washing facility. More than half (58.6%) (191/326) food premises had flies that were around and nearly a third (32.5%) (106/326) food premises had no cloakrooms. With regards to the presence of a refrigerator or freezer, about 84.7% (276/326) had a functional refrigerator, 3.7% (12/326) had no refrigerator and 11.7% (38/326) had a non-functional refrigerator (Table 2).

Table 2: Status of food preparation premises in educational settings in Kampala, Uganda

Variables	Response	Frequency (N=326)	Percentage (%)
License provided	No	60	18.4
	Yes, invalid	130	39.9
	Yes, valid	136	41.7
Compound clean and well cared for	No	30	9.2
	Yes	296	90.8
Type of structure	Permanent	254	77.9
	Semi-permanent	59	18.1
	Temporary	13	4.0
Type of ventilation	Back to back	222	68.1
	Cross	50	15.3
	Through	54	16.6
Lighting	Artificial, adequate	70	21.5
	Artificial, inadequate	166	50.9
	Natural, adequate	68	20.9
	Natural, inadequate	22	6.7
Presence of hand washing facility	No	9	2.8
	Yes	317	97.2

The provided mechanism that prevents recontamination after washing (n=317)	No	10	3.2
	Yes	307	96.9
Water from the hand washing facility is well drained (n=317)	No	49	15.5
	Yes	268	84.5
Adequate wholesome water on premises including hot water for utensil washing	No	25	7.7
	Yes	301	92.3
Presence of sanitary facility for use by attendants	No	25	7.7
	Yes	301	92.3
Sanitary facilities are clean and usable (n=301)	No	19	6.3
	Yes	282	93.7
Evidence of vector and vermin like flies	No	135	41.4
	Yes	191	58.6
Accumulation of waste around premises	No	270	82.8
	Yes	56	17.2
Presence of animals or birds	No	293	89.9
	Yes	33	10.1
Presence of a cloakroom	No	106	32.5
	Yes	220	67.5
All employees have uniforms	No	107	32.8
	Yes	219	67.2
Employees with decorated hands	No	292	89.6
	Yes	34	10.4
Employees with open wounds	No	304	93.3
	Yes	22	6.7
Material of chopping surface	Metal	80	24.5
	N/A	7	2.1
	Plastic	89	27.3
	Wood	150	46.0
Separate chopping surface for different types of food	N/A	9	2.8
	No	101	31.0
	Yes	216	66.3
There is a repository to protect from dust	N/A	1	0.3
	No	38	11.7
	Yes	287	88.0
Presence of a refrigerator/freezer	Yes, functional	276	84.7
	No	12	3.7
	Yes, not functional	38	11.7

6.3 Knowledge of food safety among food handlers

Nearly a quarter (24.8%) (81/326) of the respondents knew that food received in the establishment is safe when it's stamped, and about 65.6% (214/326) of respondents knew that food received is safe when it's clean. However, nearly a tenth (9.5%) (31/326) of the respondents didn't know how safe the food to be prepared should be. Almost all respondents (99.4%) (324/326) knew that surfaces and equipment should be cleaned before reusing them for food processing.

Key informant interviews also pointed out that the majority of the food handlers have limited knowledge regarding food safety and hygiene. It was revealed that the limited knowledge of food safety and hygiene could be because most food handlers are not trained since are employed based on other factors other than qualifications.

> *"The truth is in this community we are not knowledgeable or trained, me inclusive I just learned from someone working here. Very few were trained as food handlers. I am trained from YMCA and others are not trained. I know only three people who are trained as well in this area. The rest are not sure. We have both you are more knowledgeable about food handling in this area however they got the knowledge and skills from their parents who worked in the establishment and they decided to set up the same business. The food handlers have low knowledge because the practices they do are not in line with someone knowledgeable. They use "omwana wagundi" to operate on the premises." Health Inspector KCCA*

6.4 Attitudes towards food hygiene among food handlers

The majority, 97.5% (318/326) of the respondents agreed that they must not handle food with bruises, cuts, and injuries on their hands, and 96.3% (314/326) respondents agreed that they should not use watches, earrings, and rings, nearly all respondents, (98.7%) (322/326) agreed that they should keep working surfaces and utensils clean to reduce risks of illness, about 92.9% (303/326) respondents agreed using different knives and cutting boards for different foods, and about 94.5% (308/326) respondents agreed that knives and cutting boards should be properly sanitized to prevent cross-contamination. About 80.1% (261/326) respondents disagreed with using the same towel to clean many places, and about 97.2% (317/326) respondents felt knew that sneezing or coughing without covering their mouths could contaminate food (Table 3).

Table 3: Attitudes towards food safety among food handlers in educational settings in Kampala, Uganda

Variable	Response	Frequency (N=326)	Percentage (%)
Food handlers with bruises, cuts, and injuries on their hands must not touch or handle food	Agree	204	62.6
	Disagree	5	1.5
	Strongly agree	114	35.0
	Strongly disagree	3	0.9
Using watches, earrings and rings will increase the risk of food contamination	Agree	215	66.0
	Disagree	10	3.1
	Strongly agree	99	30.4
	Strongly disagree	2	0.6
Regular training improves food safety and hygiene practices	Agree	237	72.7
	Disagree	2	0.6
	Strongly agree	84	25.8
	Strongly disagree	3	0.9
Safe food handling to avoid contamination and disease is part of food handler job responsibilities	Disagree	2	0.6
	Agree	233	71.5
	Disagree	1	0.3
	Strongly agree	90	27.6
Keeping working surfaces and utensils clean reduces the risk of illness	Strongly disagree	2	0.6
	Agree	239	73.3
	Disagree	2	0.6
	Strongly agree	83	25.5
Using different knives and cutting boards for different foods is worth	Agree	246	75.5
	Disagree	21	6.4
	Strongly agree	57	17.5
	Strongly disagree	2	0.6
It is unsafe to leave food out of the refrigerator for more than 2 hours	Agree	239	73.3
	Disagree	38	11.7
	Strongly agree	46	14.1
	Strongly disagree	3	0.9
Inspecting food for freshness and wholesomeness is valuable	Agree	256	78.5
	Disagree	4	1.2
	Strongly agree	65	19.9
	Strongly disagree	1	0.3
After processing food, any leftovers should be kept in a cool place	Agree	261	80.1
	Disagree	7	2.1
	Strongly agree	56	17.2
	Strongly disagree	2	0.6
Raw foods are healthier and more nutritious than cooked foods	Agree	132	40.5
	Disagree	84	25.8
	Strongly agree	104	31.9
	Strongly disagree	6	1.8
	Agree	254	77.9

Knives and cutting boards should be properly sanitized to prevent cross-contamination	Disagree	18	5.5
	Strongly agree	54	16.6
The same towel can be used to clean many places	Agree	62	19.0
	Disagree	193	59.2
	Strongly agree	3	0.9
	Strongly disagree	68	20.9
Sneezing or coughing without covering our noses or mouth could contaminate the food	Agree	246	75.5
	Disagree	7	2.1
	Strongly agree	71	21.8
	Strongly disagree	2	0.6
Wearing protective clothing and shoes helps improve workplace safety and hygiene practices	Agree	265	81.3
	Disagree	2	0.6
	Strongly agree	59	18.1
Putting on hair cover on the head is a good practice in the food industry	Agree	270	82.8
	Disagree	2	0.6
	Strongly agree	54	16.6
It is important to use potable water to wash working surfaces and cutting tools after disinfection	Agree	271	83.1
	Disagree	2	0.6
	Strongly agree	53	16.3
Changing or sterilizing the cutlery in between food processing limits cross contamination	Agree	278	85.3
	Disagree	7	2.1
	Strongly agree	40	12.3
	Strongly disagree	1	0.3
Food handlers get ill if they have contact only with the blood of animals during work activities	Agree	104	31.9
	Disagree	172	52.8
	Strongly agree	4	1.2
	Strongly disagree	46	14.1
Food handlers contaminate food when they are ill	Agree	161	49.4
	Disagree	111	34.0
	Strongly agree	25	7.7
	Strongly disagree	29	8.9
Having a family member suffering from diarrhea and vomiting would stop you, someone, from working in the food establishment	Agree	111	34.0
	Disagree	141	43.3
	Strongly agree	7	2.1
	Strongly disagree	67	20.6
Food handlers contaminate food through handling, coughing, and sneezing	Strongly disagree	2	0.6
	Agree	237	72.7
	Disagree	7	2.1
	Strongly agree	80	24.5

6.5 Medical history of food handlers

About 20.9% (68/326) of respondents suffered from diarrhea in the last 12 months, however, about 15% (49/326) suffered from diarrhea in the last 30 days. About 7.7% (25/326) suffered from typhoid fever and 44.8% (146/326) had no symptoms of any of the listed illnesses (Figure 1). In the last 30 days, about 24.5% (80/326) of respondents suffered from respiratory tract infections like cough and 16.3% (53/326) sometimes had allergic reactions like itching skin.

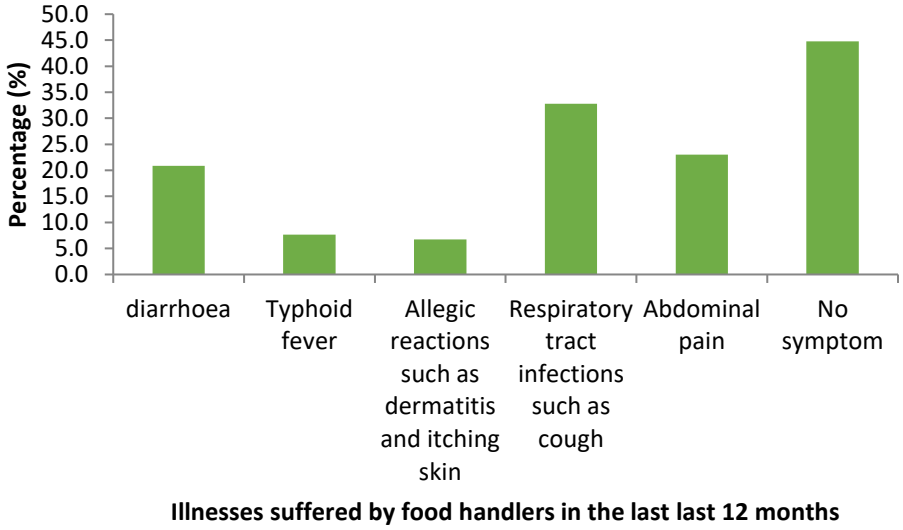

Figure 1: Illnesses that affected food handlers in the last 12 months in Kampala, Uganda

6.6 Food safety protective wears among food handlers in Educational settings

About 76.7% (250/326) respondents had a head covering, about 89% (290/326) respondents had aprons and about 18.4% (60/326) had boots. About 78.4% (196\250) wore a visibly clean head covering, and 21.6% (54\250) wore visibly dirty aprons. About 63.1% (183\290) had visibly aprons while 36.9% had visibly dirty aprons. About, 18.4 % (60) of food handlers wore boots, 56.7% (34\60) had visibly clean boots and 43.3% had visibly dirty boots (Figure 2).

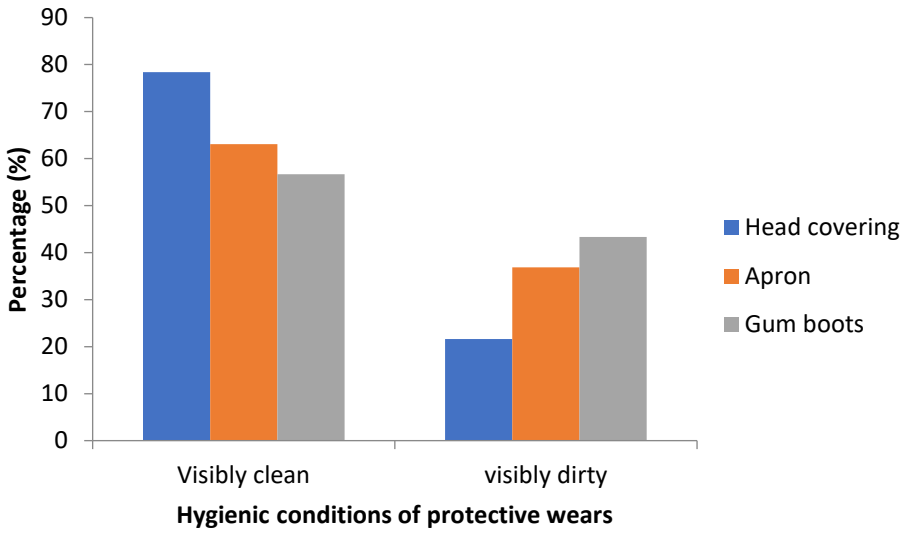

Figure2: A graph showing the hygienic status of the protective wear worn by food handlers in educational settings

6.7 Food safety practices among food handlers in educational settings in Kampala, Uganda

Slightly more than three-quarters (77%) (251/326) of the food handlers had separate knives for serving different types of foods and about 87.1% (284%) of food handlers keep leftover foods in the refrigerator. Nearly all the food handlers (96.9%) (316/326) do not smoke or are non-smokers, however, 0.6% (2/326) smoke in the food establishment (Table 4). Key informant interview revealed that despite good cooking skills, most of the food handlers prepare food from dirty places

> *"Regarding our area, we as chefs cook properly our food but truth be told the place where we prepare food is not clean. They have stagnant water when preparing food and a lot of food spice residues, however, the food turns out sweet. Food handlers do not wear headgear yet this might be dangerous to consumers because the hair might get into the food. In my case, I cover my food but some I witnessed do not cover it. Another thing is, they wear necklaces, rings on fingers that might fall into food might rise a problem. Most do not care as they come into this business with no training at all. As a general overview, we need a lot of things to learn." Senior Chef, Yesu Amala Restaurant*

with stagnant water and food residues. Additionally, most food handlers dress unhygienically and do not use protective wear such as head gears and aprons which could pose a risk of food contamination. Qualitative interviews revealed that food handlers have varying food preparation methods. It was noted that some food handlers use polythene bags while others use banana fibers when preparing food.

Qualitative interviews pointed out that food practices among most food handlers vary with the size and nature of the premises. It was noted that food practices when preparing food from a large premise differ from those on small premises. Also, food practices when cooking from home differ when cooking at the workplace.

> *"Food practices will vary based on the size of the premises. Large premises will need too much work to be done compared to the small ones. The premises one is working from can influence your practices. Like I handle food differently when am home and I use different materials than when at my workplace. However, there should be no differences in food-related practices varying based on the size of the food premises. Because it's all food consumed by people. They are all supposed to handle well" Chef KK restaurant*

Table 4: Food safety practices among food handlers in educational settings in Kampala, Uganda

Variable	Response	Frequency(N=326)	Percentage (%)
Has a separate knife for serving different types of foods	Yes	251	77.0
	No	75	23.0
Food gets finished	Never	1	0.3
	Sometimes	284	87.1
	Always	39	12.0
	Rarely	2	0.6
Storage of food remains (n=287)	Other (Specify)	37	12.9
	Refrigerator	250	87.1
Mechanism of repelling flies*	Use of a fly screen	11	3.4
	Use of chemicals	149	45.7
	Use of cloth	261	80.1
	Others	6	1.8
Smoke in the food establishment	No	8	2.5
	Not a smoker	316	96.9
	Yes	2	0.6

Multiple response*

6.8 Medical examination and Training

About 16.6% (54/326) respondents attended food safety training, about 64.8% (35/54) attended in more than 12 months and 35.2% (19/54) attended in less than 12 months. About 12% (39/326) of food handlers were medically examined 43.6% (17/39) in a period of fewer than 12 months, and slightly more than a half (56.4%) (22/35) in more than 12 months. About 70.6% (12/17) of food

handlers were examined in a period of fewer than 12 months and had medical certificates (Table 5).

Table 5: Medical examination and training of food handlers in educational settings in Kampala, Uganda

Variables	Response	Frequency(N =326)	Percentage (%)
Attended food safety training	No	272	83.4
	Yes	54	16.6
Has attended the training for a specific period (n=54)	More than 12 months	35	64.8
	In the last 12 months	19	35.2
Medically examined	No	287	88.0
	Yes	39	12.0
Medically examined as a food handler (n= 39)	In the last 12 months	17	43.6
	More than 12 months	22	56.4
Has medical certificate (n=17)	No	5	29.4
	Yes	12	70.6

6.9 Personal hygiene among food handlers in educational settings in Kampala, Uganda

About 87.4% (285/326) respondents had short fingernails, and nearly all of the food handlers (99.7%) (325/326) wash hands after handling waste or garbage, however, about 20.2% (66/326) respondents handled food with cuts, bruises, and injuries on their hands. Almost all food handlers (99.1%) (323/326) always wash service utensils and always remove work equipment when going to the toilet (96.3%) (314/326) (Table 6).

Table 6: Personal hygiene of food handlers in educational settings in Kampala, Uganda

Variable	Response	Frequency(N=326)	Percentage (%)
Food handlers with short fingernails	No	41	12.6
	Yes	285	87.4
Food handlers that eat in the workplace	No	11	3.4
	Yes	315	96.6
Food handlers that smoke inside the food establishment	No	8	2.5
	Not a smoker	316	96.9
	Yes	2	0.6
Wash hands after handling waste or garbage	Yes	325	99.7
	No	1	0.3
Wash hands after sneezing and coughing	No	58	17.8
	Yes	268	82.2
Wearing masks always when handling food	No	282	86.5
	Yes	44	13.5
	No	1	0.3

Properly clean the food storage area before storing new products	Yes	325	99.7
Always wash service utensils	No	3	0.9
	Yes	323	99.1
Sterilize or replace service utensils	No	24	7.4
	Yes	302	92.6
Always remove work equipment when going to the toilet	No	12	3.7
	Yes	314	96.3
Removes personal stuff when processing food	Yes	293	89.9
	No	33	10.1
Handles food when ill	No	283	86.8
	Yes	43	13.2
Handles food with a cut, bruise, or wound on the hand	No	260	79.8
	Yes	66	20.2

6.10 Factors associated with poor food safety-related practices among food handlers

After adjusting for age, sex, religion, and level of education, only sex and the level of education were statistically associated with poor food safety-related practices. The prevalence of poor food safety-related practices was 31% higher among males compared to females (PR 1.31,95% CI: 1.07 -1.60). The prevalence of poor food safety-related practices was 85% higher among those who didn't attain any education level compared to those who had attended a secondary level of education. (PR 1.85, 95% CI:1.31-2.61). The prevalence of poor food safety practices was 44% higher among those who attained a primary level of education compared to those who had attained a secondary level of education (PR 1.44, 95% CI,1.16-1.79) (Table 7).

Table 7. Factors associated with poor food safety-related practices among food handlers in educational settings Kampala, Uganda

Variable	Frequency (N=326)	Practices		CPR (95% CI)	APR (95% CI)	P-value
		Good (n=115)	Poor (n=171)			
Sex						
Female	223 (68.4)	116 (74.8)	107 (62.6)	1	1	
Male	103 (31.6)	39 (25.2)	64 (37.4)	1.29 (1.05-1.58)	1.31 (1.07-1.60)	0.008*
Age category (Years)						
18-24	141 (43.3)	64 (41.3)	77 (45.0)	1	1	
25-30	147 (45.1)	71 (45.8)	76 (44.4)	0.94 (0.76-1.17)	0.95(0.76-1.17)	0.637
>30	38 (11.7)	20 (12.9)	18 (10.5)	0.86 (0.60-1.25)	0.82 (0.57-1.17)	0.284
High education level						
Secondary	236 (72.4)	122 (78.7)	114 (66.7)	1	1	
None	8 (2.5)	1(0.6)	7 (4.1)	1.18 (1.35-2.42)	1.85 (1.31-2.61)	p< 0.001*
Primary	55 (16.9)	16 (10.3)	39 (22.8)	1.46 (1.18-1.82)	1.44 (1.16-1.79)	p<0.001*
Tertiary	27 (8.3)	16 (10.3)	11 (6.4)	0.84 (0.52-1.35)	0.84 (0.51-1.40)	0.526
Marital status						
Divorced	3 (0.9)	1 (0.6)	2 (1.2)	1		
Married	62 (19.0)	33 (21.3)	29 (17.0)	0.70 (0.30-1.63)		
Separated	8 (2.5)	5 (3.2)	3 (1.8)	0.56 (0.16-1.87)		
Single	247 (75.8)	116 (74.8)	131 (76.6)	0.79 (0.35-1.78)		
Widower	6 (1.8)	0 (0.0)	6 (3.5)	0.50 (0.67-3.34)		
Religion						
Catholic	126 (38.7)	57 (36.8)	69 (40.4)	1	1	
Others	18 (5.5)	6 (3.9)	12 (7.0)	1.21 (0.84-1.75)	1.11 (0.78-1.58)	0.541
Protestants	125 (38.3)	60 (38.7)	65 (38.0)	0.94 (0.75-1.19)	0.95 (0.76-1.20)	0.715
Muslim	57 (17.5)	32 (20.6)	25 (14.6)	0.80 (0.57-1.11)	0.79 (0.56-1.09)	0.163
Ownership of the food establishment						
Joint ownership	14 (4.3)	7 (4.5)	7(4.1)	1		

Owned by another person	276 (84.7)	136 (87.7)	140 (81.9)	1.01 (0.59-1.73)		
Owned by operator	36 (11.0)	12 (7.7)	24 (14.0)	1.33 (0.75-2.36)		
Regularly employed						
No	4 (1.2)	3 (1.9)	1 (0.6)	1		
Yes	322 (98.8)	152 (98.1)	170 (99.4)	2.11 (0.38-11.59)		
Years worked in the food establishment						
1-5 years	295 (90.5)	142 (91.6)	153 (89.5)	1		
6-10 years	26 (8.0)	10 (6.5)	16 (9.4)	1.18 (0.85-1.63)		
Above 10 years	5 (1.5)	3 (1.9)	2 (1.2)	0.77 (0.26-2.27)		

(CPR)-Crude Prevalence Ratio at 95% confidence Interval and (APR)- Adjusted Prevalence Ratio at a 95% CI and a P-value of 0.05

Chapter Seven: DISCUSSION

This study assessed knowledge, attitudes, and food safety-related practices among food handlers in educational settings. Nearly two-thirds of the respondents knew that food received in the food establishment was safe if it looked clean, and nearly a quarter of it was stamped. However, nearly a tenth did not know how to identify unsafe food. The majority of the respondents agreed that safe food handling to avoid contamination is part of the food handlers' job responsibilities, and nearly all the respondents, agreed that regular training improved food safety and hygiene practices. Slightly more than a tenth of respondents are medically examined as food handlers while the majority are not medically examined. Nearly all the respondents agreed that wearing protective clothing and shoes improves workplace safety and hygiene practices. The majority of the respondents agreed that food can be contaminated by handling, coughing, and sneezing near it. The majority of the respondents agreed that surfaces and equipment should be kept clean before being reused for food preparation. About 80.1% of the respondents used a cloth to repel flies while 3.4% used a fly screen. The majority of the respondents kept the remaining food in a refrigerator.

The majority of the food handlers agreed that regular training improves food safety and hygienic practices. Training enables food handlers to acquire knowledge and skills that enable them to make informed decisions about food safety. Acquisition of knowledge and hygiene protects consumers from food-related health risks such as food contamination. This was in line with a study done by Malavi et al. (2021) where most of the respondents acknowledged that training was important in food handling. Food handlers in the current study were generally knowledgeable about how to identify safe food. They reported that foods like vegetables, fruits, and cereals needed to be free from dirt (clean) while meat had to be stamped. This is in line with studies conducted in Uganda by Sylvia et al. (2015) in Makerere University food services facilities which indicated that respondents had better knowledge, especially those with high education levels regarding the safety of food.

Food handlers generally agreed that wearing protective clothing and shoes improves workplace safety and hygiene practices. Protective clothing and shoes reduce the risks of food handling-related injuries like burns, cuts, and falling objects. Clothing like hair nets and aprons help food handlers hygienically prepare food and prevent foreign objects like hair from falling into it. This

is in line with a study done by Nakyanzi (2016) where almost all respondents agreed that wearing protective clothing like masks, aprons, and shoes reduces food contamination. Food handlers were mostly positive about keeping clean surfaces and equipment before re-using when preparing food. Food equipment and surfaces carry food contaminants like germs, and dust if they are not cleaned before being reused. This is in line with a study carried out by Sylvia et al. (2015) which indicated that food could be contaminated by serving utensils however properly it might be prepared.

The majority of the food handlers were not medically examined while slightly more than half were medically examined in a period of more than one year. Medical examination identifies possible foodborne diseases in food handlers so that they can be treated early to ensure the consumers' safety. This is in line with the study done by Kamau et al. (2012) where pre-placement and in-service medical examination of food handlers located within the premises of the medical college was observed to be unsatisfactory. Almost all respondents are nonsmokers while almost a tenth of the food handlers smoked in the food establishment. Without washing hands, contaminants from the smoke (which contains many carcinogens and other toxic chemicals) ruin the taste of food and add unnecessary risks to the consumer. This is in line with a cross-sectional study carried out by El-Shenawy et al. (2014) showing skin carriage of cigarette smoke among food handlers. Additionally, almost all food handlers in the study stored the remaining food in a refrigerator. Refrigeration is a helpful tool to keep foods fresh longer. This is in line with a study done by Al-Kandari et al. (2019) where the majority of the food handlers stored the leftover food he refrigerators. Most of the food handlers used cloths and fly screens however a few used chemicals to repel flies on the food premises. The use of chemical repellents with prolonged exposure results in prolonged health effects like the development of diseases. Fly screens and cloths are more environmentally friendly and effective than chemicals to keep out insects. This is in line with study done by Kumari and Kapur (2018) where catering establishments majorly had fly screens and used a cloth with detergent to clean places that attracted flies.

In this study, the prevalence of poor food safety-related practices was 31% higher among males compared to females because males are generally unhygienic for example they openly cough, do not wear headgear, do not like washing their protective wear and hands, and are less health conscious than females (Courtenay, 2000) which in turn poses a likelihood of food contamination. Its further revealed in this study that the prevalence of poor food safety practices was getting lower

as one attained a certain level of education. Education is an essential tool ensuring that food handlers have the awareness and knowledge necessary to comply with food hygiene and safety (Siau et al., 2015). Food handlers are taught topics concerning food hygiene and food-related practices, for example food preservation methods, storage methods and food safety tips.

Chapter eight: CONCLUSION AND RECOMMENDATION

Conclusion

This study found out there was a gap in food hygiene knowledge, attitude, and practices by food handlers. Results showed that food handlers lacked knowledge and training related to proper food handling and cross-contamination. Results also showed that the majority of the food handlers lacked formal food training education and most of them attained a secondary level of education. Food-related practices were poor as food handlers did not wear appropriate protective clothes like aprons, headgear, and boots when handling food.

Recommendations

To managers of food premises

- Managers should organize and arrange periodic food safety training, especially on the hygiene-related issues of the food handlers in the establishment. These pieces of training will enable food handlers to exhibit good practices when they acquire appropriate knowledge concerning food safety.
- Managers of the food premises should arrange routine and periodic medical examinations to prevent any chances of contamination of food by the ill employees.
- Food managers should provide appropriate personal protective wear like aprons, gloves, boots, and headgear to food handlers and ensure the correct use of the equipment.

KCCA

- KCCA should enforce the food safety guidelines or standards that should be followed by all restaurants in educational settings. For example, the types of structures where food handlers operate from (building standards), license provision only to those that are fit, and proper waste disposal facilities. This will help control foodborne illnesses among students in educational settings.
- KCCA through Health Inspectors should sensitize food handlers about food safety and the dangers of poor food-related practices.

Ministry of Health (MoH)

- The Ministry of Health in Uganda should create awareness programs and campaigns on Food standards and safety, as these are effective tools for improving knowledge regarding food safety and is fundamental to proper food practices.
- The Ministry of Health should recognize and set up food training schools that will teach food handlers good food practices.
- Implementation and enforcement of food safety policies that are against poor food safety practices in food establishments like the use of polythene bags.

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APPENDICES

Appendix 1: Budget

ACTIVITY	ITEM REQUIRED	QUANTITY	UNIT COST(UGX)	TOTAL COST(UGX)
	Printing Binding	100 pages 2 copies	100 pages 2 copies	10,000 3,000
DATA COLLECTION	Mobile internet router Internet	1 50GB	150,000 2,000	150,000 2,000
DATA ANALYSIS	Consultation			50,000
REPORT WRITING	Printing Binding	100 pages 4 copies	100 1,500	10,000 6,000
Miscellaneous				50,000
GRAND TOTAL				379,000

Appendix 2: Consent Form for study participants

Project Title: Knowledge, Attitude, and Practices regarding food safety among food handlers in educational settings in Kampala, Uganda.

Introduction

Hello, my name is GALIWANGO JOVAN. I work with Makerere University School of Public Health. I would like to invite you to participate in a KAP (Knowledge, Attitude and Practices) study regarding food safety among food handlers in Kampala, Uganda. The study is called "Knowledge, Attitude and Practices regarding food safety among food handlers in educational settings in Kampala, Uganda".

The objective of the study

The main objective of this study is to establish the level of knowledge, attitude, and food safety related practices among food handlers in educational settings in Kampala to inform concerned stakeholders on better ways of regulating food safety.

Procedure

Data collection will be conducted using three different methods. Observation checklists will be used to assess the safety of premises where food is cooked, prepared, and stored. Semi-structured interviews will be conducted with food establishments in Kampala city. A semi-structured questionnaire will be used to interview food handlers about how they store food, how food is handled, perceptions of food safety, and how they protect the health of consumers. In addition, qualitative interviews will be carried out with key informants, food establishment managers, and food chefs to generate detailed information on food safety practices, and perceptions. The semi structured interviews will take about 15 minutes while the qualitative interviews will take about 30 minutes.

Risks from Being in the Study

The study will not cause any physical, social, economic, or legal harm to you and there is no risk associated with it. Data analysis and reporting will not use your details. Any identifying information will be kept confidential and only available to the study team. There will be no

disclosure of information that may result in administrative consequences. You are free to decline to answer any interview question in this survey and you can stop the interview at any time.

Benefits

An opportunity to have your ideas shared with policymakers and program implementers to influence and contribute to the promotion of food safety will be provided to the population.

Assurance of Confidentiality

Information collected from you is to be kept confidential (secret) by the Makerere University of Public Health to the full extent allowed by law. All data will be kept under password-protected computers to avoid unauthorized access to the data. Finally, your name will not be linked to your views; we will report about people's views in general and no attempt will be made to link the views to those who shared them.

Questions/Points of Contact

If you have any questions for me, about the study or the consent document, please ask before signing, and I will do my best to answer them. You will receive a copy of this consent form. If you have additional questions or if you need to discuss any other aspect of the study, you can contact me on 0751799058.

Participation is Voluntary

This study has been reviewed and approved by the Makerere University School of Public Health Higher Degrees, Research and Ethics Committee and by the Uganda National Council for Science and Technology. If you have any questions concerning your rights as a participant in this research, please contact Dr. Joseph Kagaayi, Chairperson of the Higher Degrees, Research and Ethics Committee at Makerere University School of Public Health (tel. 0702 444154) or the Uganda National Council for Science and Technology, on plot 6, Kimera Road, Ntinda, Kampala on telephone 0414-705500.

Statement of Participant Consent

I have been asked to participate in a research study named "Knowledge, Attitude and Practices regarding food safety among food handlers in educational settings in Kampala City, Uganda." The investigator , has explained the study to me and the risks this might involve. The information was read to me and I have been allowed to ask questions. All questions were answered in a way that I understand. If I have other questions about this research, I can ask the study representative or Mr. Galiwango Jovan. I understand that my agreement to participate in this study is voluntary and that I can decline to participate or leave the study at any time. I also understand that I have the right to voluntarily refuse to participate in all or part of the study. I am signing my name below to indicate my consent to participate in this study. I am given a copy of the signed consent form.

Name of participant	Signature/thumbprint of participant	Date
Name of witness	Signature of witness	Date
Name of investigator eliciting consent	Signature of investigator eliciting consent	Date

Appendix 3: Observation checklist

Study title: Knowledge, Attitude, and Practices regarding food safety among food handlers in educational settings in Kampala, Uganda.

ID No. _____ Date: _____ Name of food establishment _____ Location:
Division:_____Parish_____Zone_____

No	Questions and Filters	Coding Categories
	ID Number for the food establishment…….	
001	Number of workers	
	License provided	1. Yes, valid 2. Yes, invalid 3. No
002	Is the compound/surrounding clean and well cared for?	1. Yes 2. No
	Type of structure	1. Permanent 2. Semi-permanent 3. Temporary 4. Other (specify_____)
007	Type of ventilation	1. Through 2. Cross 3. Back to back 4. Artificial (adequate) 5. Artificial (inadequate)
008	Lighting	1. Artificial, adequate 2. Artificial, inadequate 3. Natural, adequate 4. Natural, inadequate
009	Is there a hand washing facility?	1. Yes 2. No (skip 010 and 011)
010	Is it provided with a mechanism to prevent recontamination after washing?	1. Yes 2. No
011	Is the water from the hand washing facility well drained?	1. Yes 2. No
012	Is there adequate wholesome water on the premises including hot water for washing utensils?	1. Yes 2. No
013	Is there a sanitary facility (latrine or WCs) for use by attendants?	1. Yes 2. No (skip 014)
014	Is it clean and usable?	1. Yes 2. No

015	Is there evidence of vectors and vermin such as flies, cockroaches, and rats on the premises?	1. Yes 2. No
017	Is there an accumulation of wastes (refuse/leftover foods) on the premises?	1. Yes 2. No
018	Are there animals on the food premises?	1. Yes (specify_____) 2. No
019	Is there provided a changing room (cloakroom)?	1. Yes 2. No
020	Do all employees have uniforms?	1. Yes 2. No
021	Do employees have aprons?	1. Yes 2. No
022	Are employees covering their hair?	1. Yes 2. No
023	Are there employees with decorated hands?	1. Yes 2. No
024	Are there employees with open wounds?	1. Yes 2. No
025	Material of chopping surface	1. Wood 2. Metal 3. Plastic 4. Formica 5. Other (specify_____) 6. N/A
026	Separate chopping surface for different types of food	1. Yes 2. No 3. N/A
027	Is there a repository to protect food from dust?	1. Yes 2. No 3. N/A
028	Presence of a refrigerator/freezer	1. Yes, functional 2. Yes, not functional 3. No
029	Is there any other food in the refrigerator/freezer?	1. Yes, (specify_____) 2. No

Appendix 4: Structured questionnaire for food handlers in Kampala

Study title: Knowledge, Attitude, and Practices regarding food safety among food handlers in educational settings in Kampala, Uganda.

No	Identification information	Responses/ coding categories
001.	ID No. _____	Date of interview: _____
002.	Name of Researcher	
003.	Name of Food establishment_____	
004.	Location	1. Kikumi-Kikumi
	Questions and Filters	Coding Categories
005.	Sex	1. Male 2. Female
006.	How old are you as of last birthday? (Age in years)	_____years
007.	What is your highest level of education? (Circle)	1. None 2. Primary (P.____) 3. Secondary (S.___) 4. Tertiary
008.	Marital status (Circle)	1. Single 2. Married 3. Divorced 4. Widower 5. Separated
009.	Religion	1. Catholic 2. Protestant 3. Muslim 4. Others (specify_____)
010.	Ownership of the food establishment	1. Owned by operator 2. Owned by another person 3. Joint ownership 4. Other (_____)
011.	Are you regularly employed in this food establishment?	1. Yes 2. No
012.	How long have you worked in this business? (Duration in years) Indicate 1 if less than a year)	
	Food safety practices	

013.	What protective wear do you have? (observe and circle all that apply)	1. Headgear 2. White overcoat 3. Gumboots 4. Other (specify_____)
014.	Is the head gear visibly clean?	1. Yes 2. No
015.	Is the white overcoat visibly clean?	1. Yes 2. No
016.	Are the boots visibly clean?	1. Yes 2. No
017.	Do you have a separate knife for serving these different types of foods?	1. Yes 2. No
018.	How do you know the food you have received is free from disease?	1. Presence of stamp 2. When it looks clean 3. I don't know 4. Other
019.	Does it all get finished?	1. Always 2. Sometimes 3. Rarely 4. Never
020.	Where do you keep the food that remains?	1. Refrigerator 2. Other (Specify)
021.	How do you repel flies on foods like meat and other meat products?	1. Use a fly screen 2. Use chemicals 3. Use a cloth 4. Other
022.	Is there evidence of tobacco ash in the food establishment? *food handlers are not expected to smoke while in the food establishment.*	1) Yes 2) No
	Medical examination and training on food safety	
023.	Have you ever attended any training on food safety?	1. Yes 2. No

024.	Have you attended any training on food safety in the last 12 months?	1. Yes 2. No
025.	Has anyone ever medically examined you as a food handler?	1. Yes 2. No
026.	Has anyone medically examined you as a food handler in the last 12 months?	1. Yes 2. No

027.	If yes, do you have a medical certificate?	1. Yes 2. No
028.	Food handler hygiene	
029.	Does the food handler have short fingernails?	1) Yes 2) No
030.	Does the food handler have headgear or any protective head clothing?	1) Yes 2) No
031.	Does the food handler eat or drink at your workplace?	1) Yes 2) No
032.	Do you smoke inside the food establishment?	1. Yes 2. No 3. Not applicable/ Not a smoker
033.	Does the food handler use gloves while handling food?	1) Yes 2) No
034.	Does the food handler handle money while serving food?	1) Yes 2) No
035.	Does the food handler wash hands before and after handling food?	1) Yes 2) No
036.	Does the food handler wash hands after handling waste/garbage?	1) Yes 2) No
037.	ASK the respondent: Do you always wash hands after using the toilet?	1) Yes 2) No
038.	ASK the respondent: Do you always wash your hand after smoking, sneezing, or coughing?	1) Yes 2) No
039.	ASK the respondent: Do you always wear an apron while working?	1) Yes 2) No
040.	ASK the respondent: Do you always wash your aprons after each day's work?	1) Yes 2) No
041.	ASK the respondent: Do you always wear a mask while working?	1) Yes 2) No
042.	ASK the respondent: Do you always wear a hairnet or a cap while working?	1) Yes 2) No
043.	ASK the respondent: Do you always properly clean the food storage area before storing new products?	1) Yes 2) No
044.	ASK the respondent: Do you always wash service utensils (knives, hooks, and cutting boards)?	1) Yes 2) No

045.	ASK the respondent: Do you always replace service utensils or sterilize them after each food handling?	1) Yes 2) No
046.	ASK the respondent: Do you always remove your work equipment when using the toilets?	1) Yes 2) No
047.	ASK the respondent: Do you always remove your stuff such as rings, necklaces, watches, etc. while processing food	1) Yes 2) No
048.	ASK the respondent: Do you handle/process food when you are ill?	1) Yes 2) No
049.	ASK the respondent: Do you handle/process food when you have cuts, wounds, bruises, or injuries on your hands?	1) Yes 2) No
	Medical history	
050.	In the last 12 months, have you suffered from any of the following illnesses? *(Read out to the respondent and tick all that applies)*	1) Diarrhea 2) Typhoid fever 3) Allergic reactions such as dermatitis/ itching skin 4) Respiratory tract infections such as cough 5) Abdominal pain
051.	In the last 30 days, have you suffered from diarrhea?	1) Yes 2) No
052.	In the last 30 days, have you suffered from a cough?	1) Yes 2) No
053.	In the last 30 days, how often have you suffered from itching skin?	1) Always 2) Sometimes 3) Rarely 4) Never
	Attitudes toward food preservation and safety	
	Statement	Response
054.	Food handlers with wounds, bruises, or injuries on their hands must not touch or handle food	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
055.	Using watches, earrings and rings will increase the risk of food contamination	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree

056.	Improper food storage is dangerous to health	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
057.	Hand washing before handling food reduces the risk of contamination	1. Strongly agree 2. Agree

		3. Disagree 4. Strongly disagree
058.	Regular training could improve food safety and hygiene practices	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
060.	Safe food handling to avoid contamination and diseases is part of food handler job responsibilities	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
061.	Keeping working surfaces and utensils clean reduces the risk of illness	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
062.	Using different knives and cutting boards for different foods is worth	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
063.	It is unsafe to leave food out of the refrigerator for more than 2 hours.	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
064.	Inspecting food for freshness and wholesomeness is valuable	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
065.	Surfaces and equipment should be clean before re-using for food processing	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
066.	After processing food, any leftovers should be kept in a cool place	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree

067.	Raw foods are healthier and more nutritious than cooked	1. Strongly agree 2. Agree 3. Disagree 5. Strongly disagree
068.	Knives, hooks, and cutting boards can be a source of food contamination	1. Strongly agree 2. Agree 3. Disagree 6. Strongly disagree
069.	Knives and cutting boards should be properly sanitized to prevent crosscontamination	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree

070.	The same towel can be used to clean many places	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
071.	Sneezing or coughing without covering our noses or mouth could contaminate the food	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
072.	Wearing protective clothing and shoes could help improve workplace safety and hygiene practices	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
073.	Putting on hair cover on the head is a good practice in the food industry	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
074.	It is important to use potable water to wash working surfaces and cutting tools after disinfection	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
075.	Changing or sterilizing the cutlery inbetween food processing could limit crosscontamination of food.	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
076.	Food handlers can get ill if they have contact only with the blood of animals during work activities.	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree

077.	Food handlers can only contaminate food when they are ill.	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
078.	Having a stomach ache would stop someone from working in the food establishment	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
079.	Having a wound would stop someone from working in the food establishment	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
080.	Having a family member suffering from diarrhea and vomiting would stop someone from working in the food establishment	1. Strongly agree 2. Agree 3. Disagree 4. Strongly disagree
081.	Food handlers can contaminate food through handling, coughing, and sneezing	1. Strongly agree 2. Agree
		3. Disagree 4. Strongly disagree
	Knowledge of food safety	Response
082.	How do you know the food you have received is free from diseases	Presence of stamp=1, When it looks cleans =1, I don't know=0 and Others=0
083.	Surfaces and equipment should be clean before re-using for food processing	Yes=1, No=0

Appendix 5: Key informant interview guide

Study title: Knowledge, Attitude, and Practices regarding food safety among food handlers in educational settings in Kampala, Uganda.

1. Comment on food safety practices in this community?
    - Probe: Is food inspection done at the food establishment and by who?
    - What parameters are often considered during the inspection of food, and what is the frequency of food inspection? (probe for the suitability of food handling surfaces, hygiene of food handlers, and availability of functional preservation methods such as refrigerators).
        - Are food handlers aware of the health effects of the unregulated preservatives used to preserve food and other food products?
    - What challenges do you face during food handling? Probe for challenges related to the local authority, food establishment management, food handlers, and the community at large.
2. How do the practices vary based on the size of the food premises i.e. small vs large?
3. Comment on food safety related knowledge among food handlers around Makerere?
4. How does food safety related knowledge vary based on the size of the food premises (ie small vs large)?