

PERSONAL AND ENVIRONMENTAL HYGIENE MEASURES ON FOOD SAFETY COMPLIANCE IN SELECTED PUBLIC UNIVERSITIES IN KENYA

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ABSTRACT

Inadequate compliance with food safety measures such the adoption of local and international standards has resulted in occasional outbreaks of food borne related diseases like cholera, dysentery and typhoid among others in Kenya. Hygiene measures such as personal hygiene and environmental hygiene practices are used to ensure compliance to safe food production and service. The main purpose of this study was to assess hygiene measures on food safety compliance of food production and service in selected public universities in Nairobi, Kenya. The objective of the study was to determine the effect of personal and environmental hygiene measures on food safety compliance in selected public universities in Nairobi, Kenya. University of Nairobi, Technical University of Kenya and Co-operative University of Kenya were purposively selected. Descriptive and explanatory research designs were used to guide the study. The target population was 95 food handlers and 21 departmental managers. The entire census of the target population was enrolled in the research. Self-administered questionnaires and interview schedule was used to collect primary data from food handlers and senior managers respectively. In addition

observation checklist was used to collect primary data. Cronbach's alpha analysis for internal consistency found that data collection instruments were reliable. Multiple Linear regression results show that there exists a significant positive relationship between personal hygiene measures ($r= 0.679$, $p=0.02<0.05$, $t=6.304$) and environmental hygiene measures ($r= 0.433$, $p=0.001<0.05$, $t=7.882$). The findings demonstrated that food interventions adopted have significantly improved compliance of food production and services. The study concludes that although the public universities' catering staff have adopted personal hygiene measures and with a high awareness of food safety measures, their compliance with hygiene practices was not commensurate. The study recommends that the public universities' catering outlets should develop internal policies and standard operating procedures that will help the catering staff comply with food safety measures.

Keywords: Hygiene measures, compliance with food safety measures, awareness of food safety measures, personal hygiene, environmental hygiene.

INTRODUCTION

Food and beverage production is the process of preparing ingredients to produce food products in the production areas in the hospitality industry (Hayes & Ninemeier, 2006). Food production and service focus on culinary skills, food principles, nutrition, sanitation, and hospitality management an effort to satisfy customers with compliance food and service (Kuhn, 2011). Foodservice involves serving food and beverages produced in production areas in the hospitality outlets such as restaurants, school and hospital cafeterias, catering operations, and many others (FDA, 2006). Hygiene measures includes personal hygiene, food

hygiene, environmental hygiene and equipment hygiene are the main practices used to ensure compliance to safe food production and service.

The food compliance includes external factors as appearance such size, shape, colour, gloss, and consistency, texture, and flavour (Molnar, 1995). The compliance factors considered in produced foods for human consumption are chemical, physical, microbial standards as a measure of wholesomeness (Tolla, 2010). Maintenance of food compliance and safety in the hospitality and manufacturing industries is a critical requirement of ensuring consumers are protected from any form of contamination that may occur during production and manufacturing process (Githingi, 2013). The competitiveness of food production industry such as hotels, catering institutions, restaurants cafeteria and other catering operations is dependent on the reliability of the safety and the compliance of the food produced and service (Muinde & Kuria, 2005). The goal of any food catering and service outlet is to provide high compliance and safe food that is free from any hazards (Singh, 2015).

Food hygiene measures play a critical influence on safe food production. Nevertheless alone without other interventions such as awareness creation, compliance, continuous improvement and monitoring and evaluation, it cannot assure safe food production (Lelieveld, Holah & Mostert, 2005). Food safety measures are aimed at ensuring “that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use” and are aimed at preventing and controlling “hazards [microbiological, chemical or physical agents]” (Uçar, Yilmaz & Cakiroglu, 2016). Most measures on food safety are anchored on the laws and regulations of respective countries (Mitchell et al., 2007). Countries enact laws and other regulations like by-laws in an attempt to promote food safety to prevent food hazards during manufacturing and production (Jairath & Purohit, 2013). The laws affect how foods are produced at the farm or factory level, how the foods are transported, measures of food production, service and consumption. The laws are meant to ensure food compliance and safety measures are followed by food producers and handler to satisfy all legal, customer and consumer requirements (United Kingdom Food Standard Agency, 2011).

Government all over the world takes the leading role in ensuring the foods traded are safe for human consumption in a way they will not cause any health harm to the citizens, The governments take several measures which are usually anchored in different statutory requirements inform of Acts of Parliament and secondary legislation. Government’s agencies have the responsibility of enforcing laws and regulations regarding food safety. Operators of food have the onus of implementing food safety laws and regulations (WHO, 2015). They are expected to interpret these laws in general terms on how the top management intends to do about food safety and provides the direction the institution wishes to take. This is done by developing a food safety policy statement which expresses an institution’s commitment to the implementation and maintenance of its Food Safety Management Systems (FSMS).

The level of compliance to food safety measures is used to measure the effectiveness of FSMS on compliance of food production and service in establishments (Sikora & Nowicki, 2007). Compliance to Hazard Analysis Critical Control Poin (HACCP) on food compliance

involves several measures. These measures include monitoring or verification of critical control point (HACCP) during food receiving, production in Kitchen and service in restaurants (Richard & Surak, 2010). In Kenya, various agencies are in charge of food safety and that regularly monitor food establishments for the food safety measures that they should put in place and work by always. The agencies include the Department of Public Health, which is domiciled within the Ministry of Public Health and Sanitation of Kenya. There are various pieces of legislation in Kenya relating to the measures. These include the Food, Drugs and Substances Act of Kenya, the Public Health Act of Kenya, and the Meat Control Act of Kenya.

Purpose of the Study

The purpose of this study was to examine the effect of hygiene measures on food safety compliance with food production and service in selected public universities in Nairobi Kenya.

Specific Objectives

The study was sought to examine the effect of personal and environmental hygiene measures on food safety compliance in selected public universities in Kenya.

Research Hypotheses

H0₁ Personal hygiene measures do not significantly affect food safety compliance in selected public universities in Kenya.

H0₂ Environmental hygiene measures do not significantly affect food safety compliance in selected public universities in Kenya.

Scope of the Study

The study was conducted in selected public universities targeting managers and food handlers. The universities were the University of Nairobi (UON), Technical University (TUK), and Cooperate University College of Kenya (CUCK). The food production outlets targeted within the universities consisted of establishments with fully-fledged Kitchens with dry and cold storage. The study confined to collecting data on adopted personal and environmental hygiene of food safety in an attempt to assess their effectiveness on ensuring compliance with food production and service. In this study other approaches of determining food safety, for example, microbial assessment was not considered but the study only focused on collecting data on the assessment of food safety measures as per the research objectives.

LITERATURE REVIEW

Compliance with Food Safety Measures among the Food Handlers

To ensure safety in food manufacturing, food production and service the establishments must comply with food safety measures (Hillary, 2013). The hygiene and food safety measures must be put in place by the concerned establishments so that the food handlers can observe them by practicing during their day to day duties (Government of Hong Kong, 2006).

Compliance with food safety measures can be initiated both internally and externally. Internally the management has the responsibility to come up with safety compliance policy. The management guides through internal policies on the way the food handlers should comply with the food safety measures requirements as per the organisation rules and regulations. Externally the hygiene and food safety agencies like the ministry of public health ensure compliance with food safety measures by food handlers is maintained (Hillary, 2013). This is usually done by inspecting and surveillance of establishments dealing with food manufacturing, production and service.

The external influence of food safety measures compliance has been found to affect small scale food outlets and public institutions (Fairman & Yapp, 2004). In a study conducted in the UK on the role of external enforcement on compliance with food safety legislation in small and micro-businesses, it was established that external enforcement was the main motivator (Fairman & Yapp, 2004; FAO, 2003). The same study found that small business food handlers lack the awareness and skills of food safety and therefore motivation for compliance cannot be initiated from within. Countries have enacted laws and developed regulations to be followed by any establishment that is involved in the business of foods be it manufacturing, transportation, service or production.

The law enacted is geared to national food control systems necessary to protect the health and delete the safety of consumers (FAO, 2003). In USA the US Food and Drug Administration Act apart from spelling out the requirements of the regulations for ensuring food safety, it also stipulated measures for ensuring compliance to the safety measures among the food handlers like personal hygiene and development of internal mechanism within an establishment (US Food and Drug Administration, 2015). The compliance to food safety in China the 1995 Food Hygiene Law consists of 57 articles that address general principles of food hygiene, food additives, packaging, regulations, hygiene standards and compliance through administration of food hygiene, the supervision of food hygiene and penalties (Republic of China, 1995). Though this Act stipulates tough penalties for failure to comply with food safety measures, China is still faced with food and hygiene requirements among the food handlers due to unscrupulous food production firms, lack of enforcement to compliance especially in the rural areas (Yongmin, 2008).

Compliance with food safety measures among food handlers is done through many approaches. The approaches may assume education, training, enforcement and others. A report prepared by Dubai Municipality noted that compliance with food safety measures among the food handlers is mostly done through education since the issues of food safety affect every person (Government of Dubai, 2010). The report also found that the compliance rate increased with continued education of the concerned food handlers. The lack of compliance with food safety measures has been blamed for lack of enforcement by government agencies in many developing countries (Ifenkwe, 2012). For example, a study conducted in Nigeria on food safety regulation among food handlers in most kitchens, grocery stores and catering houses in the rural area found that compliance with hygiene and

food safety regulations was very low. This was so despite that Nigeria has over nine food laws yet the compliance rate with food safety is wanting. The study found that the low compliance rate was attributed to the lack of implementation of these laws government agencies responsible for food safety compliance.

Adequate supervision of food handlers is critical in ensuring compliance with food safety measures. Food handler's needs to be constantly reminded of their role of ensuring hygiene and compliance with food safety requirements. Studies have shown that in an establishment where the food handlers are closely supervised the compliance rate is usually high more so if the supervisors are a food safety certified. On the same observation a study done in Nigeria on an assessment of food safety needs of restaurants it was established that restaurants with food safety-certified kitchen managers are less likely to violate food safety compliance as compared to restaurants whose managers are not certified (Onyeneho & Hedberg, 2013).

Food Safety Measures

Food safety encompasses actions aimed at ensuring that all food is as safe as possible. According to the World Health Organization (WHO), food safety policies and actions need to cover the entire food chain, from production to consumption (WHO, 2015). This is done as a precautionary measure of ensuring food does not get infected and cause food poisoning to consumers. From the literature, it was clear that food safety measures affect food manufacturers in industries or factories and food production in food eateries like restaurants (FAO, 2003).

Countries in the world has specified standard regulations that govern the manufacturing of foods commodities fit for human consumption. The regulation involves adherence to premises, personnel and food commodities hygiene to ensure food safety. In the manufacturing industry, food safety regulations guides on the precautions to be taken to ensure manufactured food commodities are of high standards. To ensure a high standard of manufactured food commodities issues like good hygiene practices, sourcing of raw materials from reputable suppliers, adherence to good manufacturing practices, labelling and packaging among others need to be put in place.

Several international food safety standards are applied by different establishments that deal with food businesses. These standards deal with foods at different chains of the food business. The Codex Alimentarius Commission (CAC) is an international food safety standard. CAC is a collection of internationally recognised standards, codes of practice, guidelines and other approvals relating to foods, food production and food safety (CODEX Alimentarius, 2015).

The Hazard Analysis & Critical Control Points (HACCP) is one of the methods used in food establishments to ensure food safety. HACCP is a management system in which food safety is addressed through the analysis and control of biological, chemical, and physical hazards

from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product (US Food and Drug Administration, 2015). A HACCP system is based on the seven principles which are: hazard analysis, critical control point identification, the establishment of critical limits, monitoring procedures, corrective actions, record keeping, and verification procedures.

By law, it is not mandatory to put the HACCP system in place in an establishment since it is voluntary but it's widely used in food establishment as a measure of ensuring food safety (FDA, 2006). In the European Union (EU), it is mandatory to incorporate HACCP system in all food business (Vucic & Milanov, 2006). Most studies have found that the HACCP system is one of the most effective food safety measures in food production in the hospitality industry. A study conducted in Montenegro in Belgrade on the importance of application of HACCP in culinary of tourism foods established that though HACCP was not widely used it has helped to improve food safety (Vucic & Milanov, 2006).

These food standards, codes and other regulations under CAC provide a reference for member's countries to model their domestic food legislation and regulations to abide with international trade requirements on food safety (CODEX Alimentarius, 2015). This food safety requirement affects manufactured foods that are traded outside the countries which will ultimately be consumed in restaurants and homes. Most food establishments who are conscious of food safety will purchase food commodities from suppliers whose products adhere to CAC standards.

Food establishments normally put in place cultural practices as measures of ensuring hygiene and food safety among the food handlers (Anuradha & Dandekar, 2014). These cultural practices involve personal and environmental hygiene. Food handlers are required to maintain adequate personal hygiene like trimming nails and hair, washing hands before preparing food and after visiting bathrooms (Alli, 2003). On realization that food safety is a significant public health issue WHO came up with five keys to food safety to educate the public on food safety (WHO, 2006). These five keys to food safety are; keep clean, separate raw and cooked food, cook food thoroughly, hold/keep food at a safe temperature and use safe water and raw materials while producing foods. If these five keys to food safety are observed by food establishments the issues of food poisoning caused by poor personal hygiene, cross-contamination, premises and environmental causes will be eliminated.

The food manufacturers have the onus taking all responsible precautions where hygiene is concerned due to regulatory constraints and current management practices. Hygiene auditing is a practice of setting up comprehensive measures in a food production establishment to ensure food safety during purchasing, receiving, preparation, production, storage, service and disposal (Chesworth, 1999). The primary purpose of hygiene auditing is to identify hygiene and food safety weaknesses and develop a system of correcting the identified weaknesses. The auditing system put in place is supposed to monitor the adherence to hygiene and food safety measures against different safety standards such as the country public health regulations, international industry standards such as ISO 22000 Food Safety Management

Systems, IS 340 Catering Industry, IS 341 Food Retailing and IS 342 Food Processing. The hygiene auditing systems is a tool that is used to ensure establishments comply with internal and external hygiene and food safety requirements.

Business dealing with food business more often contract consultants to develop and implement food hygiene auditing systems. The food hygiene auditing systems safety standards include HACCP, ISO 22000, and Codex Alimentarius Commission (CAC) among others (CODEX Alimentarius, 2015). The auditing systems developed provides a framework and processes of ensuring the establishments comply with food safety requirements as stipulated in food safety standards preferred by each establishment.

Personal and Environment Hygiene Measures

According to Magda *et al.*, (2012), personal hygiene amongst those handling food is critical when preparing food as this helps prevent spreading of infectious diseases. Personal hygiene includes hand washing before, during and after food handling as the persons handling food may contaminate cooked and raw food stuffs. Personal hygiene may also include use of protective gloves and uniforms as some bacteria like *Escherichia coli* and *Salmonella* may survive on unclean surfaces or work places, even un-washed hands for a long time even days after initial contact with these microorganisms according to Roberts *et al.*, (2012). These bacteria can cause illness and death in some circumstances as well as suffering and large economic costs (Wilfred and Fairuze, 2011).

According to FAO (2013), poor personal hygiene is among high risk factors in food borne illness occurrence. Some clients are reluctant to frequent food joints that show low level of cleanliness as they fear food borne illnesses. Awareness of personal hygiene requirements play a major role in preventing contamination of food. Food handlers should dress in clean uniforms, wash hands properly with hand wash before and after handling food, after visiting the toilet, touching raw food or any other materials. Fingernails should be kept short and clean, they should be in waterproof dressing like gloves when needed (Chapman *et al.*, 2011). Food Drugs and Chemical Substances Act (GoK, 2013) and the Environmental Management and Co-ordination promotes health and safety within the workplace and areas that are not considered dangerous have other risks associated with them, and with effective management, those risks can be lowered significantly (GoK, 2015) its mandatory for any food production establishment must comply with all the above Acts to be allowed to operate. These Acts regulates how food should be handled during production and service, how food is stored and how to construct buildings and how to dispose of wastes. Besides, food establishment must comply with the by-laws for each.

According to Massawe, (2013), environmental hygiene includes clean compounds and working surfaces. Also, there should be proper disposal of waste both solid and liquid. The premises should be regularly fumigated to eliminate pests and rodents. Cleaning of food storage areas should be done to reduce food borne illnesses. The European Union Food Safety Standard EC No.178/2002 stipulates that food premises ought to meet varied

environmental standards relating to their construction. According to the standard, the premises should be put up in ways that minimises the related potential for causing environmental pollution and causing contamination. The standard spells out varied environment-related regulations relating to how kitchens and other food premises are laid out (McElhatton & Marshall, 2007). The Kenya Public Health Act, Cap 242 of 1986 provides that the food premises should be designed properly so that they are easy to clean, maintain, and repair (Shikwati & Inter Region Economic Network Kenya, 2003).

The design of the premises should allow for the separate storage of uncooked products, which are deemed to be low-risk materials, and cooked products, which are deemed to be high-risk materials (Shikwati & Inter Region Economic Network Kenya, 2003). As well, the premises ought to have sufficient space and should be put up in fitting locations. They should be well-equipped to make environmental hazard control easy. Food premises should have sufficient supplies of water, lighting, and ventilation. Their surroundings should be free of pests (Foeken, 2005; Shikwati & Inter Region Economic Network Kenya, 2003). The surroundings should be devoid of breeding grounds for pests such as mice and flies.

The premises should be equipped with adequate sanitary facilities, including rest rooms, and hand wash basins. Such facilities should be located in appropriate areas and should be adequate (Foeken, 2005; Shikwati & Inter Region Economic Network Kenya, 2003). The facilities used in handling and moving food materials should be of high sanitation standards (Foeken, 2005). The related waste disposal areas and facilities should be maintained well and located in appropriate areas: refuse should not be moved through dining rooms or kitchens.

Theoretical Framework

This study used the Theory of Planned Behaviour (TPB) and social cognitive theory to guide this study. The TPB states that “attitude toward behaviour, subjective norms, and perceived behavioural control, together shape an individual's behavioural intentions and behaviours” (Armitage & Christian, 2004). The Theory of Planned Behaviour (TPB) started as the “Theory of Reasoned Action in 1980 is used to predict an individual's intention to engage in the behaviour at a specific time and place. The theory was intended to explain all behaviours over which people can exert self-control.” The TPB has been applied to studies of the relations among beliefs, attitudes, behavioural intentions and behaviours in various fields such as advertising, public relations and healthcare among others. The adoption of food safety measures depended on the attitude of the management and the food handlers which affected their behaviour towards changing for or against compliance to food safety measures. TPB was used to inform this study on the factors influencing compliance to set food safety measures. TPB was chosen since it was found useful in assessing the hygiene measures that were adopted to ensure food safety among the food handlers.

Social Cognitive Theory (SCT) stipulates that interplay of environmental, personal, and other behavioural factors influence one another in a bidirectional process that is termed as triadic reciprocal causation (Bandura, 1999). The social cognitive theory emphasizes that behaviours

are influenced by the environment and personal factors (Baranowski, Perry & Parcel, 2002). A person's behaviour will be influenced by their beliefs, attitudes, and perceptions. Central concepts in the social cognitive theory are those of skills and self-efficacy. If a person perceives an incentive related to a specific behaviour, they must believe they are capable of performing it (self-efficacy). Success at performing the behaviour enhances the probability that the behaviour will be performed again (Yongmin, 2008). Social cognitive theories state that behaviour is determined by personal, behavioural, and environmental factors. According to social cognitive theory, the education program should include multiple avenues, such as cognitive change, skill improvement, and environmental change. In addition to the targeted beneficiary, it is important to educate customers and hotel staff (Fairman & Yapp, 2004). An effective nutrition education program improves quality compliance with set product standards of food. This theory was used to identify the environment and personal factors that influenced food handlers' behavioural in practicing hygiene measures that ensured safe food production.

RESEARCH METHODOLOGY

Study Area

The study was conducted in selected public universities in Nairobi, Kenya - University of Nairobi, The Technical University of Kenya and Cooperative University College of Kenya. The three universities are located in Nairobi City. These universities were chosen because they met the inclusion criteria of having a fully-fledged food production and service units.

Research Design

A descriptive and explanatory design was used to guide the study. Survey research is one of the most significant areas of measurement in applied social research (Trochim, 2006). The broad area of survey research encompasses any measurement processes that involve asking respondents questions. According to Newby (2010), a descriptive survey research design is appropriate in describing characteristics of respondents under survey. This research design was used to collect both quantitative and qualitative data. Quantitative data approach measures numerical variables and analyses with descriptive statistical procedures (Creswell, 2013). This design was appropriate for this study because it described the characteristics of the sampled population to generalise the study findings for the entire population. As well, an explanatory research design was used in the study – the value judgements of the researcher were key as they were elementarily informed by her inclinations regarding specific phenomena.

Target Population

The study targeted 95 operations staff working in the catering unit in three public universities. The respondents were operations staff who comprised of kitchen supervisors, cooks, waiters or waitresses, kitchen stewards and food store personnel. In addition, the study

also targeted 21 managers as key informants' responsible for managing these catering establishments. These managers comprised of the catering manager, executive chef and head of stores. The choice of the managers was informed by the fact that they were the main decision-makers regarding food safety measures and their views were critical to this study. Table 3.1 tabulates the target populations.

Sampling

Purposive sampling method was employed by the researcher to select the three universities. Purposive sampling method was also employed by the researcher to select the 21 departmental managers. The 95 food handlers were selected through a census sampling. There are various reasons why the researcher settled for the purposive sampling method. First, the method presented the researcher with opportunities for creating generalizations from the data that she gathered in the study. The method provided justifications for making generalizations from the universities that she selected the 95 food handlers and 21 departmental managers who were selected. Secondly, the method allowed the researcher an opportunity for selecting every university in the Kenyan university population and anyone in the food handler population and the departmental manager population.

Research Instruments

This study used questionnaires with open and closed-ended questions to collect primary data from food handlers and structured interview guide was used collect primary data from managers. Questionnaires were appropriate for this study because of the ability to cover a large number of participants in a relatively short time and at the same time ensured the confidentiality of the respondents. A structured interview schedule was applied because of the ability to collect in-depth information through probing which could not be captured using questionnaires. Besides, the study used an observation checklist and photography to collect data regarding food safety. The instrument helped the researcher to collect sensitive data which could not be gotten by directly interviewing the respondents.

Instruments Reliability and Validity

Reliability

The pre-testing results were subjected to Cronbach alpha to determine the reliability of the instruments. Cronbach's alpha is a statistic that is used as a measure of internal consistency or reliability of an instrument. In this study, Cronbach alpha was used to measure the reliability of questionnaires for the food handlers. Cronbach's alpha coefficient reliability normally ranges between 0 and 1 (Boberg, Nerbonne & Watt, 2018). If Cronbach's alpha reliability coefficient value is equal or greater than 0.7 it meant the instruments were reliable but if the results are less than 0.7 meant the instruments was not reliable. The piloted questionnaires were found varied at Cronbach's alpha reliability coefficient test of 0.828.

Validity

Validity is the accuracy or meaningfulness and technical soundness of the research. It is the degree to which a test measures what it purports to measure. The validity of the instrument was established by seeking expert opinion from the supervisors.

Data Collection Procedure and Analysis

The respondents in the selected institutions were identified and briefed on the purpose of the study and administered the questionnaires. The respondents were allowed to fill the questionnaires and after a week all the questionnaires were collected. The researcher interviewed the catering managers, executive chef and head of stores face to face at their offices.

Data collected using questionnaires was cleaned, coded and inputted into the Statistical Package for Social Sciences (SPSS) version 20 computer software for analysis. Open-ended question responses captured from questionnaires were grouped according to themes and coded to produce data that was analysed quantitatively. Oral interview captured qualitative data which was grouped into themes and presented in narratives and verbatim reporting. Discussions and inferences were done to describe the findings. Quantitative data were analysed descriptively to produce descriptive statistics. The analysed quantitative data were presented in tables and charts. The data found was subjected to interpretation with support of documented research findings. Inferential statistics multiple linear regression techniques were computed to determine the influence of independent variables.

Ethical Considerations

Permission was sought from Moi University, the National Commission of Science, Technology and Innovation (NACOSTI) and respective institutions before embarking on data collection. A briefing on data collection was done to ensure participants are aware of the expectations of the researcher and the respondents. To ensure confidentiality, the names, personal numbers or any other forms of identification were not recorded on the questionnaire and the final report. Also, the identity of the Universities where data was collected was concealed by providing them code numbers. The interviewees were identified as manager XX when quoting them verbatim in the report to ensure the confidentiality of their responses.

Results and Findings

Personal Hygiene Measures

The study sought to establish the effect of practices of personal hygiene measures on compliance with food production and service measures in the catering units of the sampled university. Findings are presented in Table 4.1.

Table 1: Personal hygiene measures on compliance with food production and service measures

	SD		D		NAD		A		SA		Mean
	f	%	f	%	f	%	f	%	f	%	
Hand washing after visiting washrooms	0	0.0	0	0.0	0	0.0	0	0.0	91	100	0.000
Hand washing before and after handling foods	0	0.0	0	0.0	0	0.0	0	0.0	91	100	0.000
I wash my hands properly before and after touching raw foods to avoid cross contamination	0	0.0	0	0.0	0	0.0	7	7.7	84	92.3	4.93
Using gloves while handling salads	0	0.0	5	5.5	0	0.0	0	0.0	86	94.5	0.687
I wash hands properly before using gloves during the distribution of unpacked foods	0	0.0	0	0.0	0	0.0	0	0.0	91	100	4.92
I wear head gear when cooking foods to prevent loose hairs from falling onto the food	0	0.0	0	0.0	0	0.0	1	1,1	90	98.9	5.00
I sanitize cutting boards between preparation of raw foods and cooked foods	0	0.0	0	0.0	0	0.0	1	1,1	90	98.9	4.99
Cleaning the working areas after and before food preparation	0	0.0	0	0.0	0	0.0	0	0.0	91	100.0	0.000
Adhering to policy of clean as you go after handling every item	0	0.0	0	0.0	0	0.0	0	0.0	91	100.0	0.000
Kitchen and stores staff are provided with uniforms and shoes	0	0	0	0	0	0	1	1.1	90	98.9	4.99
When a staff is sick or have cut she /he is always given a sick off	0	0	0	0	0	0	0	0	91	100	5.00
Safety protective gears/tools/ equipment are provided to kitchen, service and stores personnel	0	0	0	0	0	0	1	1.1	90	98.9	4.99
I am aware of the role food safety protection gears in the food preparation areas for hygiene	0	0.0	0	0.0	0	0.0	9	9.9	82	90.1	4.90

Likert scale key: SD = Strongly disagree, D=Disagree, NAD=Neither agree nor disagree, A=Agree and SA=Strongly agree.

From the findings in Table 1, the majority (100%) of the respondents strongly agreed that they wash their hands every time after visiting the washrooms. The same high rating (100%) of strongly agree on washing hands before and after handling foods and cleaning working areas before and after food preparation was recorded among the food handlers. All (100%) the respondents strongly agree that they adhering to a policy of clean as you go after handling every item. It was revealed by this study that majority (94.5%) strongly agreed they use gloves while handling salads.

On provision of sick-off, the study found that staffs are allowed time off since 100% of the respondents strongly agreed on the same. The study established that 98.9% of the respondents also strongly agreed that food production, service and stores staff are provided with uniforms and shoes. Also, 98.9% of the respondents strongly agreed that safety protective gears are provided to kitchen, service and stores personnel. The findings above overall portray a positive situation on how the operations staff observes person hygiene to ensure food safety. However, data collected using photographs (Plate 1) contradicted the findings in Table 1



Plate 1: Kitchen staff on duty without uniform

The finding in plate 1 shows one of the kitchen staff supervisor who was on duty without official uniform. This finding is an indicator of lack of adequate allocation of operations budget, making the procurement of the requisite official uniform a challenge. An oral interview with one of the senior catering manager confirmed the following;

“....catering staffs are expected to maintain a high standard of personal hygiene. However, due to lack of adequate allocation of operations budget, we are unable to provide items like gloves, uniforms, cleaning materials among others. We have experienced situations where kitchen staff operates without essential items like salad gloves”.... (Oral Interview with Manager XX1)

The above sentiments are supported by the findings of the checklist. From the observation checklist it was established that majority of the food handlers in most cases were not washing hands before and after handling foods. It was also observed that wearing of official uniform and covering of their heads was not adhered by all food handlers as expected. No adherence to the use of colour coding chopping boards. This was so since only one chopping board was used for both cooked and uncooked foods. This practice created a fertile room for cross contamination which has the potential endangering food hygiene a recipe for food poisoning. To a large extent it was observed that personal hygiene was not practiced, more so there was no deliberate effort by food handler to continuously clean the working services or sanitizing

tools and equipment after use. There were no kitchen stewards (Kitchen cleaners) readily available to keep the place clean continuously as is the norm to ensure food safety during and after production. From the above observation it is clear that personal hygiene practices were not adhered to creating doubt of the safety of foods produced.

Environmental Hygiene Measures

The study found it worth to establish the effect of environmental hygiene measures practice on compliance with food production and service measures in the catering units of the sampled university. The findings are presented in Table 2.

Table 2: Environmental hygiene measures on compliance with food production and service measures

	SD		D		NAD		A		SA		Mean
	f	%	f	%	f	%	f	%	F	%	
Availability of policy on environmental hygiene measures	0	0	0	0	0	0	6	6.6	85	93.4	4.93
Fumigation of premises is done after every 3 – 6 months	0	0	0	0	0	0	5	5.5	86	94.5	4.95
Minimizing the entry of rodents, insects and birds in the premises	0	0	0	0	0	0	0	0	91	100	5.00
Proper cleaning of the food storage area before storing new products	0	0	0	0	0	0	0	0	91	100	5.00

Likert scale key: SA=Strongly Agree, A=Agree, NAD=Neither agree nor disagree, D=Disagree and SD=Strongly disagree.

The findings in Table 2 shows that majority (93.4%) of respondents strongly agreed that there is a policy of environmental hygiene measures that is in place in the institutions. About 94.5% of the respondents strongly agree that fumigation of the premises is done after every 3-6 months. The study also revealed that 100% of the respondents agreed that measures of minimising the entry of rodents, insects and birds in the premises are in place in the catering institutions.

The evidence gathered by photographs (Plates 2 and 3) contradicted the responses given by the respondents regarding the environmental hygiene measures.



Plate 2: Compromised environmental hygiene practices



Plate 3: Entry of rodents

From the findings in Plates 2 and 3 it's evident that environmental hygiene practices were compromised despite the strong compliance confirmation by operations staffs. From the observation checklist it was established that environment in and around the food production areas were not hygienically kept. It was noted in one kitchen that the floor was worn out resulting in stagnant spilt water (Plate 2). This observation implies that there is no deliberate effort of maintenance of the premises through continuous repairs. It was established that rodents, cockroaches, black-ants were sighted. This is centrally to the responses by the food handlers who indicated to large extent fumigation is regularly done and physical barrier is in place to prevent rodents. It was also found that there were no signs showing entry and exit points to ensure safe working environment. From the checklist it was noted that waste bins were not kept covered throughout in some lacked covers. From the above checklist findings it is clear that environmental hygiene practices were not adhered to creating doubt of the safety of foods production in all the kitchen premises explored.

Inferential Statistics

Multiple regression analysis was generated to determine the influence of independent variables on the dependent variable. The findings of multiple regression analysis are presented in Tables 3, 4 and 5.

Table 3: Model Summary

	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change
1	.688 ^a	.474	.461	.80424	.000
a. Predictors: personal and environmental hygiene measures					
b. Dependent Variable: Compliance with safe food production and service					

R-Squared is the proportion of the variance in the dependent variable. R-Squared indicates the correlation between the observed and predicted values of compliance of food production implying that there existed a significant correlation between food safety management systems and compliance of food production and service in selected public universities with a correlation factor = 0.474 at a significant level of 0.000. Adjusted R² is called the coefficient of determination and indicates variation in compliance of food production and service in selected public universities varied with variation in food safety management systems, the value of adjusted R² is 0.461 This implies that there was a variation of 46.1% of compliance of food production and service in selected public universities in Nairobi, Kenya varied with food safety management systems, food safety measures, of awareness of food safety and compliance with food safety measures at a confidence level of 95%.

Table 4: ANOVA results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.120	3	.404	9.763	.000 ^a
	Residual	92.872	87	.988		
	Total	104.992	90			
a. Predictors: personal hygiene, environmental hygiene, food hygiene, equipment hygiene measures						

The total variance (104.992) was the difference into the variance which can be explained by the independent variables (Model) and the variance which was not explained by the independent variables (Error). The study established that there existed significant goodness of fit between Food safety measures and compliance with food production and service. This implied that, there level of variation between food safety measures and compliance with food production and service was significant.

Table 5: Coefficient Analysis

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	T	Sig.

1	(Constant)	6.429	.972		2.522	.015
	Personal hygiene measures	.679	.205	.512	6.304	.002
	Environmental hygiene	.433	.111	.363	7.882	.001
	a. Predictors: personal hygiene, environmental hygiene, b. Dependent Variable: Compliance with safe food production and service					

The regression coefficients results presented in table 5 shows that personal hygiene (Beta=0.512) contributed the most on compliance to safe food production and service. On the other hand environmental hygiene measures (Beta=0.363) contributed the least. Regression equation; $Y = 6.43 + 0.679 (\text{Personal hygiene measures}) + 0.433 (\text{Environmental hygiene measures})$ that the independent variables have a positive coefficient, which means that they were direct proportional to compliance to food safety production and service.

The above results imply that that a unit increases in personal hygiene measures will increase compliance to food safety change by 0.679 units while environmental hygiene measures will influence change by 0.433 units. In conclusion, the inferential statistics showed that compliance with food safety production and service is directly related to the independent variables explored in the study.

The above findings show that personal hygiene measures have a higher influence (0.512 units) on compliance to safe food production and service. This implies that putting personal hygiene food safety measures and interventions would significantly improve compliance with food production and services in public universities. However, from the observation findings the behaviour and actions of the food handlers portrays different scenarios.

SUMMARY OF FINDINGS AND DISCUSSIONS

Effect of Personal and Environmental Food Safety Measures on Food Safety Compliance with Food Production and Service

About 85.0% of the operations staff indicated that they practiced food safety measures. However, observation (photographs and checklist) and key informants interview revealed that was not the case. Results on whether there was the availability of personal hygiene put in place that ensures compliance with food production and service measures, majority of the respondents strongly agreed that using gloves while handing salads and adhering to policy of clean after handling every item are the personal hygiene measures put in place to ensure compliance with food production and service measures. The study found that there was cleaning of the working areas after and before food preparation. Other hygiene practices in place were hand washing every time after visiting the washrooms and before and after handling foods.

This study revealed that the availability of environmental hygiene measures put in place to ensure compliance with food production and service measures. These measures included prevention of entry of rodents, insects and birds. Also, the fumigation of premises was done

after every 3 – 6 months. The study established that there were no thawing freezers to thaw frozen meats but instead, food handlers used running water or microwave. The study also found that proper storage of red and white meats which were kept in separate fridge/freezers/cold rooms as improve compliance with set product standards ion of foods and services. This was commendable as it ensured food safety during production and service.

The results of this study on the assessment of the good hygienic practices and good kitchen practices revealed it was not adequate. There were notable improper hygiene practices among the food handlers as was documented by the photographs taken in the premises. The respondents on the other portrayed from they practiced sound hygiene practices but their actions during food production were on the contrary. It was established by this study there were no standard food safety systems in place.

Extent of Compliance to Food Safety Measures

The results of this study found that overall behavioural compliance concerning food safety remained low even after food safety training. It was established that a few of the food handlers were using the HACCP system. Additionally, only a few of the study participants reported having attended any educational courses on food hygiene and safety measures. More information regarding food hygiene through enlightening courses has been well established by this study. This study's findings indicate lack of refresher courses on food safety training, poor working conditions, high turnover amongst establishment handlers, lack of properly functioning equipment's, lack of water, lack of recognition by the university management and insufficient supervision as the major perceived barriers hindering compliance to food safety standards and prevent them from performing their duties adequately.

The majority of all the food handlers felt the need for more information. Lack of formal training or education regarding food hygiene among the majority of the food handlers in this study could be the result of negligence on the part of the university management which should ensure training and certification of individuals working in foodservice in the university establishments. Lack of training may increase the likelihood of food contamination leading to outbreaks (WHO, 2006).

From these findings, there is a clear indication that the application of and adherence to food safety has not been widely used and that this is likely to hurt the general knowledge and food handling practices of food handlers. This supports the idea that the HACCP approach, when adopted by and administered in the university, is a useful educative tool that provides useful information about food-hygiene practices to food handlers through continuous training and refinement of proper hygienic technique and the involvement of each individual at each operation step by step. Previous studies have emphasized that food handlers are more willing to be involved with HACCP if they have already experienced it (Whitehead & Orriss, 1995). Moreover, it was realized that most universities do not carry out hygienic procedures such as cleaning schedules and personal hygiene, which are required by the model HACCP plans. These necessity practices are the foundation for any successful eventual transition to

the HACCP system. Additionally, of concern is that only a few of the university performed bacterial sampling of food, this is probably because the rest of the university had not implemented HACCP system and considering it is one of the ways of verifying the effectiveness of the HACCP plan.

Lack of major positive change amongst the food handler's practices after the food safety observation was witnessed in this study. This could be recognized to self-report other than actual observation in both the standard and interventional stages. The reported harmful practices have the potential to transfer pathogenic organisms to food and merit attention. In spite of the food handlers being aware and have a positive attitude towards food safety practices, the reported lack of safe practices highlights a gap between knowledge and attitude and actual food safety practice. Other studies (Azanza and Zamora-Luna, 2005) have shown similar findings while Ball and Aung (2009) found a significant discrepancy between reported food safety knowledge and actual food safety practice.

Meer and Misner's (2000) research showed that although participants in a US Food and Nutrition Education program with previous food safety education scored higher than those without it on 11 food safety knowledge questions, there were no significant differences in their practices (Meer & Misner, 2000). Other factors in the workplace that were highlighted through observation that could have contributed to the perceived gaps are the availability of appropriate equipment's and facilities.

Without actually going into the facility and observing the workers' food handling behaviours, it is hard to determine if, as a result of the food safety measures and awareness, the participants will adopt safe food handling behaviours. This study employed an onsite inspection program with the aid of the observation checklist to assess whether the knowledge showed by food handlers was put into practice. In a review of food safety studies, Redmond & Griffith (2003) showed that food safety knowledge, attitudes, intentions, and self-reported practices did not correspond to observed behaviours, suggesting that observational studies provide a more accurate indication of the food safety practices uses in food preparation.

Another study by Nyamari, Mugendi, Keraka and Agwata (2014) reported that food safety training does not necessarily guarantee that the workers carry out safe food handling behaviours. The study suggested that barriers preventing the workers from always practicing safe food handling included lack of time, lack of staff and lack of resources. These results were based on the food handlers 'self-reported practices, like the food safety practices survey in this study. Additionally, similar relevant reports such as by Akabanda, Hlortsi and Owusu-Kwarteng, (2017). Also showed that consumers were knowledgeable about food safety, but this knowledge was not always reflected in their food handling behaviour when they were observed.

However, Akabanda et al. (2017) found out that knowledge on specific food borne pathogens and food safety practices did not affect the food handlers 'willingness to change their behaviour. In another study conducted in school foodservice employees 'food handling and

practices and food safety knowledge and attitudes, it was established that the food safety knowledge was high, but when handling behaviours were observed, the safe food handling was not practiced (Henroid & Sneed, 2004).

In contrast, some studies demonstrate increased food safety practices as a result of food safety education when food handlers are observed. Studies have reported that food safety education helped to increase food safety measures conditions in the food production and service in hotels (McFarland, Checinska Sielaff, Rasco & Smith, 2019). These studies suggest that food safety did lead to increased adoption of safe food handling practices as evidenced in a grown-up care facility audit (Soneff *et al.*, 1994) and restraint inspection scores (Nyamari, Mugendi, Keraka and Agwata (2014). The study revealed that management ensures that staff compliance with the maintaining places of work under their control in a safe condition and ensure safe entrances and exits and also management ensures that there's no experience of water shortage in the premises as indicated by a mean unnecessary at this stage. The study also revealed that government agency inspects the catering premises after every six months; staff follows fully the standards operating procedures (SOP) or instruction that promote food safety and that staff have a food handler certificate from the ministry of health public health department.

The study revealed that environmental protection agency collects the garbage disposed within the catering premises weekly, a certificate for food handling is mandatory and that staff check the condition/compliance of foods before issuing/cooking. The study further revealed that management ensures that sanitation requirements and regulations are observed at the premises as per the guidelines were written by the regulatory body and that management ensures the staff complies with HACCP food safety requirements. The study found that there is a significant positive relationship between compliance with food safety measures and Compliance with food production and service measures public universities in Nairobi unnecessary demonstrating that compliance with food safety measures would impact positively improve Compliance with food production and service measures.

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