

ASSESSMENT OF FOOD SAFETY KNOWLEDGE, ATTITUDE AND PRACTICE
AMONG RESTAURANT WORKERS IN KISUMU CITY, KENYA

BY

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ABSTRACT

Food safety is an important public health concern, because a large number of people take their meals outside the home and are exposed to food borne illnesses. Restaurant workers play a key role in prevention of occurrences of food borne illnesses besides meeting the goal of serving safe food. Kisumu, the third largest City in Kenya has an assortment of restaurants serving its diverse population. Cases of food borne illnesses have continued to be reported in the City for many years. Whereas contributing factors of unsafe food in restaurants have been documented, limited studies have been undertaken to assess food safety knowledge, attitude and practice among restaurant workers in Kisumu city. In order to address this problem, the following objectives were formulated for the study: To find out the level of food safety knowledge among restaurant workers, to establish the attitude of restaurant workers toward food safety, to ascertain the level of food safety practice among restaurant workers and to determine the inter-relationships between food safety knowledge, attitude and practice among restaurant workers. The study considered restaurants which employed 15 workers or more because they were regarded as large scale food service operators. According to this criterion, 51 restaurants were identified with a population of 1,190 workers. Creative Research Systems formula was used to give a sample size of 292 workers. Proportionate random sampling technique based on the number of employees was used to select the sample for study. Self-administered questionnaires and interview schedules were used to collect data. Data was analysed using descriptive statistics namely, frequencies, means and standard deviations. Pearson's product moment correlation coefficient was used to establish relationships between the variables under study. Results arising from the study showed that restaurant workers in Kisumu city possess a high level of knowledge and positive attitude toward food safety. However, their level of food safety practice was only moderate. Knowledge of food safety exhibited statistically significant relationship between attitude toward food safety on one hand ($r=0.25$, $p<0.01$), and food safety practice on the other ($r=0.16$, $p<0.05$), Attitude toward food safety also showed statistically significant relation towards food safety practice ($r=0.30$, $p<0.01$). These results will aid restaurant managers and trainers in developing training plans and instructional materials as well as being reference material for those in hospitality industry that have a responsibility of ensuring safe foodservice in restaurants and other public eating places.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Food safety is an issue of concern the whole world over (World Health Organization, 2007). Food provides the necessary nutrients for the normal body functions and it is also a means through which pathogenic substances get into the human body (FAO, 2005). If food is not handled hygienically, it can be a mode of transmission of microbial, chemical, and physical hazards to the body (Mensah *et al.*, 2002). Food, a composition of natural ingredients referred to as nutrients that are needed by man for survival, is considered safe if there is certainty that no harm will result from its consumption under anticipated conditions of use (Bekker, 2003). Agents which cause harm to humans are transmitted to an individual in various ways, but more so through food as an element in the transmission chain (Helms & Scallan 2004). Consumption of food containing such harmful substances may result in illness such like cholera, hepatitis, salmonellosis and typhoid (Chakravarty, 2001; Foskett & Cesarani, 2007). Other food borne problems are as a result of naturally occurring toxins such as aflatoxin and ocratoxin A occurring in many staple foods such as rice, maize, and in certain types of mushrooms; unconventional agents which causes bovine spongiform (mad cow disease) which is associated with Creutzfeldt-Jacob disease in humans. Most of these ills are attributed to foods from unsafe sources, inadequate cooking, improper holding temperature, contaminated equipment and poor personal hygiene by the food worker (USDA, 2000; WHO, 1999; Weistein, 1991).

According to Cohen et al, (2001) food borne illnesses may culminate from unsafe food actions of restaurant workers who may transmit pathogens passively from contaminated source, for example from raw food to food such salad which are eaten without heating. Workers may also be origins of disease causing microorganisms either during the course of gastrointestinal illness or during and after convalescence, when they no longer have symptoms (Cohen et al, 2001). Hands of a food handler may be a vector in the spread of food borne diseases because of poor personal hygiene or cross contamination, for example a worker might contaminate his hands when using toilet, or bacteria might be spread from raw to cooked food through the workers hands (Ethiri & Morris, 1996). Food poisoning results from ingestion of microorganisms that might be present in contaminated food which may have resulted from storage or preservation techniques or unsafe handling practices arising from contamination from surfaces, equipment or from workers who carry pathogenic microbes in their skin or nares (Griffith, 2010). Infected food handlers are also a common source of food borne viruses such as hepatitis A and diarrhea-causing viruses which are excreted in large numbers by infected individuals (Barrie, 1996). Poor sanitary practices in food storage, handling and preparation can also create an environment in which bacteria such as, cholera, campylobacter, salmonella and other infectious agents are more easily transmitted (Fielding et al., 2001). According to Ombui, et al (1999) and WHO (2001), most incidents of food illness involve food prepared in large quantities as in restaurants, hospitals and institutions.

It is estimated that food workers' mistakes contribute 97 percent of cases of food borne diseases in the whole world (Howes *et al.*, 1996; Shewmake & Dillion, 1998). Outbreaks or individual cases of food poisoning or food borne illness may be costly to restaurants because of the negative image it may possibly create about the establishment WHO (2001). Safe food

ensures minimal risks to human health through protecting and preventing edible substances from becoming hazardous in the presence of chemical, physical and biological contaminants that deteriorate or spoil food (Arampath, 2010). Cohen et al, (2001) observed that a worker who possesses appropriate knowledge, attitude and skill can guarantee food safety. Consequently any form of compromise on safety of food would result in an occurrence of food borne disease or diseases (Kitagwa, 2005). From the foregoing, it becomes necessary that restaurants ensure food safety against contaminants and microorganisms (Chakravarty, 2001).

It is estimated that the African continent alone loses 2,000 lives every day as a result of consumption of unsafe food (WHO, 2005). Since 1971, Kenya has suffered several waves of food borne disease occurrences with the worst being cholera epidemic which lasted two years (1997 to 1999), in which 33,400 people were affected. This accounted for 10 percent of all cholera cases in African continent at that time. Infections due to *Salmonella typhi*, *Salmonella paratyphi*, *Shigella* spp, are also under constant surveillance by the ministry of health and sanitation as they pose a serious public health hazard resulting in high morbidity and mortality (Ombui, et al., 2001; WHO, 2010).

Globalization of trade in food has increased the demand for more international regulation and harmonization in food standard specifications and food regulatory procedures (Van der Heijden et al, 1999). Failure to meet regulatory standards by any food service outlet is assumed to increase the risk of food borne diseases (Kassa, H, 2001). However, in Kenya existing laws and regulations governing the handling and sale of food are disjointed as they are managed by various government agencies, including Ministries of Public Health and Sanitation, Agriculture and Local Government, as well as government agencies which include, Kenya Bureau of Standards (KEBS), Kenya Plant and Health Inspectorate

(KEPHIS), Weights and Measures Department (WMD), Government Chemist Department(GCD), Department of Veterinary Science (DVS), Kenya Dairy Board and Horticultural Crops Development Authority (HCDA) (Kitagwa et al. 2012). These Kenyan food safety control agencies, operate autonomously to realize the purpose for which they were established alongside complimenting government laws and regulations which regulates aspects of food sale for example Food, Drugs and Chemical Act Cap 254, Public Health Act Cap 242, Hotel and Restaurant Act Cap 49 and Kenya Bureau of standards Act Cap 406 (Oloo,2000). Since Kenyan food safety legislation has been left for regulatory agencies to enforce, this has often led to a more reactive than preventive food safety programs (WHO, 2005).

Kisumu city has had major incidences of food borne disease outbreaks between 1997 and 2009. In 2008, cholera outbreak was the worst epidemic ever in the city and in the region at large (WHO, 2008). Of the nine districts affected (Kisumu municipality, Kisumu West, Migori, Nyando, Rongo, Siaya and Suba Bondo, Homabay, Kisii South), Kisumu municipality reported the highest figures of 376 cases and 12 deaths (WHO, 2008). In view of the risks associated with food handling in Kenya generally and Kisumu city in particular, it becomes necessary to investigate the knowledge, attitude and practice of those who handle food.

1.2 Statement of the Problem

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Despite mechanisms put in place by the Government of Kenya to ensure food safety in food service outlets such as restaurants, cases of food borne illness continue to be reported in Kisumu city. The City reported major food borne illness outbreaks in 2008 and 2009 with former year indicating the worst scenario (Maoulidi, 2011). Studies related to food safety knowledge, attitude and practices of restaurant workers points out that information on risk

factors for food borne diseases imply that most outbreaks result from improper food handling by workers and thus propose that food handling problems by workers need be explored. It is therefore important to assess food safety knowledge, attitude and practice of restaurant workers in Kisumu city as an attempt to help reduce food borne illness in the city.

1.3 Purpose of the Study

The purpose of the study was to investigate food safety knowledge, attitude and practices of restaurant workers in Kisumu city with a view of providing restaurant management with relevant information that can assure safe food provision.

1.4 Specific Objectives

The specific objectives of the study are as follows;

- i. To ascertain the level of food safety knowledge among restaurant workers in Kisumu city.
- ii. To establish the attitude of restaurant workers toward food safety in Kisumu city.
- iii. To ascertain the level of food safety practice among restaurant workers in Kisumu city.
- iv. To determine the inter-relationships between food safety knowledge, attitude and practice among restaurant workers in Kisumu city.

1.5 Research Questions

The following research questions guided this study:

- i. What is the level of food safety knowledge among restaurant workers in Kisumu city?
- ii. What attitude do restaurant workers have toward food safety in Kisumu city?



of its population by guaranteeing access to safe food. Information on risk factors for food borne diseases show that, most outbreaks result from improper food handling by workers and need to be investigated (Ehiri & Morris, 1996).

According to WHO (2009), Kisumu city has a relatively high prevalence of food borne illness cases. Of the nine districts affected in 2008 and 2009 (Kisumu city, Kisumu West, Migori, Nyando, Rongo, Siaya and Suba Bondo, Homabay, Kisii South), Kisumu city reported the highest figures of 376 cases and 12 deaths.

Findings of the study will provide information necessary for restaurant managers and trainers in developing training plans and instructional materials. The study will also act as reference material for workers of restaurants in Kisumu city and hospitality industry at large who have the liability of ensuring safe foodservice in restaurants and other public eating places. The information would also be useful to policy makers of restaurants in Kisumu City their attempt to eliminate food borne illnesses.

1.9 Conceptual Framework

This study adopted a conceptual framework in Figure 1, developed by the researcher to illustrate the relationships between food safety knowledge and attitude toward food safety, and food safety practice. In the study, workers knowledge and attitude of food safety may influence food safety practice. Attitude towards food safety may also influence the level of food safety knowledge and food safety practiced.

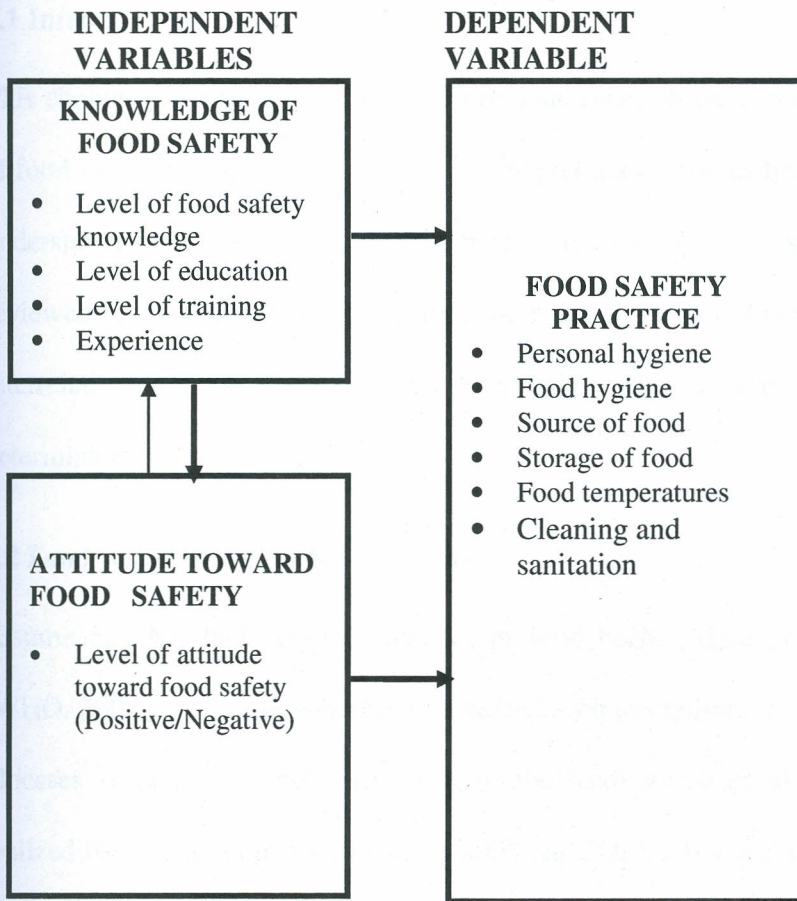


Figure 1: Conceptual framework for factors contributing to service of safe food in restaurants.

Source: Author

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CHAPTER TWO

REVIEW OF LITERATURE

2.1 Introduction

This chapter provides an overview of previous research on knowledge, attitude and practice of food safety among food handlers. The chapter also explores literature that is relevant to the understanding of food safety with a bias to restaurant workers. In particular, literature is reviewed food borne illness in Kisumu, contributing factors of unsafe food in restaurants, and interrelationships between workers' knowledge, attitude and practice of food safety as determinants of food safety.

2.2 Food borne illness in Kisumu City

Kisumu city has had major incidences of food borne disease outbreaks in the recent past (WHO, 2009). Food and waterborne diseases such as cholera, amoebiosis and other intestinal illnesses caused by e- coli, are some of the leading causes of death in the city. Kisumu realized the worst cholera outbreak in 2008 and 2009, when it reported the highest figures of 376 cases and 12 deaths (WHO, 2009). Whenever an outbreak of cholera occurs in the Nyanza region, Kisumu City is usually one of the worst affected localities, mainly because the city's surface water and high water table are contaminated with human and animal faeces particularly during the rainy season. (Maoulidi, 2011). Ministry of Public Health and Sanitation attributes the disease outbreaks and individual food borne illness cases to improper food preparation and handling practices by food handlers, access to safe water, defective sanitation systems and proximity of latrines to water sources and consequent cross contamination.

2.3 Contributing Factors of Unsafe Food in Restaurants

Several contributing factors of unsafe food in restaurants have been documented. These include knowledge of food safety, attitude toward food safety and food safety practice. These factors, together with interrelationships are discussed below.

2.3.1 Knowledge of Food Safety

It is important for food handler to have knowledge of food safety (Cohen et al., 2001). Education, training and development of food safety certification examination are ways of ensuring restaurant workers are proficient and knowledgeable about food safety and sanitation principles (Jacob, 1989). It is through food safety training that food service workers are brought to execute proper food handling practices and to serve safe food (Hailu et al., 2010). Lynch et al. (2003) also associates food safety training with increased knowledge among food service operators as in restaurants.

McIntosh *et al.* (1994) noted that food handlers with appropriate knowledge of food safety make the basis of safe food. In a similar manner, Almanza and Nesmith (2004) observed that lack of appropriate knowledge limits workers' compliance to food safety requirements. Whereas these observations are important in the food service industry, Bas et al. (2004) found that food handlers in food service establishments such as restaurants often have little understanding of the risk of microbial or chemical contamination of food or how to avoid food contamination in general.

Cotterchio *et al.* (1998) evaluated the effectiveness of a food manager training and certification program to increase compliance with sanitary codes in Boston, USA. The study showed a significant improvement in mean inspection scores in restaurants after training

managers compared to restaurants that did not receive the training, and also recounted a significant decrease in food safety violations in restaurants with trained managers compared to restaurants without trained managers one year after training.

Ackah *et al.* (2011) conducted a study involving food vendors in Accra to assess their knowledge in food hygiene. The researcher found that generally, food vendors proved to be quite aware of the knowledge of food safety. However, the study recommended that there was need to offer food vendors further education to improve their knowledge of food safety.

Kitagwa, et al (2006) observed that there was general laxity in monitoring of sanitary standards in food kiosks in Eldoret Municipality in Kenya, and that this had raised questions regarding the personal hygiene practices of food handlers. Subsequently, Kitagwa, et al (2006) conducted a study to assess the knowledge of food handlers in food kiosks in relation to food hygiene. The study found that the majority of food handlers did not receive any formal food hygiene training and therefore did not have a high level of general food hygiene knowledge.

Ngere (2010) observed that there is a great risk in handling large quantities of food. The researcher conducted a study involving 110 learning institutions with feeding programmes in Nairobi Kenya. The objective of the study was to determine the food safety practices and their determinants in primary, secondary and post-secondary learning institutions. An important finding of the study was that food handlers' food safety knowledge is an important determinant of food safety practices suggesting need to conduct a study on the relationship between food handlers' knowledge on food safety and food safety practice.

2.3.2 Attitude toward Food Safety

Workers' attitude toward food safety plays a pivotal role in the restaurant industry. Harvey et al. (2002) found that workers' attitude towards food safety varies according to their level of responsibility within the organization. The implication of this finding is that managers of restaurants and those in supervisory positions generally have positive attitude toward food safety and are therefore likely to perform better than other workers. However, Cushman *et al.* (2001), observed that the longer an employee stays in an organization, the poorer he is likely to perform on matters relating to food safety regardless of their positions within the organization, perhaps because their attitude gets more and more negative with the length of stay in employment. Thus, it is worth studying how attitude of employees towards food safety relates with their ages (Livesey & Clayton, 2010).

Reason *et al.* (2001) reported that individuals who perceive high organization support are likely to get involved in food safety related behaviors. If sufficient facilities are available then there is support for food safety but if it is absent then workers perceive food safety as not important hence they will be negative about it.

2.3.3 Food Safety Practice

Restaurant workers, as food handlers, play an important role in ensuring food safety during production and distribution of food (WHO, 1989). If the workers' personal hygiene is not appropriate, they may cross contaminate raw and processed food or act as asymptomatic carriers of pathogenic organisms and contribute to the spread of diseases to customers (Walker and Jones, 2003).

Inappropriate food handling practices by restaurant workers are the main cause of food borne illnesses (Jones & Angulo, 2006; WHO, 2004). According to Olsen *et al.* (2000) about half of

the food borne illness in restaurants is associated with unsafe employee behavior since a large number of restaurant workers engage in risky food handling practices (Green *et al.*, 2005). Other factors have also been cited by different researchers as influencing workers food safety practice in restaurants. For example, restaurants with varied and extensive menus perform dismally regarding food safety practice compared to those with simple and less complicated menus for the reason that extensive menus make it difficult for restaurants workers to monitor all food items during preparation with regard to food safety (FDA, 2002). Such restaurants have complex food handling procedures are at high risk of food borne illness outbreak, a typical characteristic of full service restaurants (Fransh *et al.*, 2003).

Restaurants with lots of business volume fluctuations tend to rely on part time, contract and temporary workers on which they put little effort to train or guide. These workers in most circumstances are less committed to organizations and display unfavorable behaviours to organizations they work for and also exhibit high turnover (Cregar, 1989; Nickel 1989). From FDA (2000) observation, challenges such as staff turnover and varied menus are a hindrance in ensuring the safe handling of the various food items in restaurants. For example, results of a study carried out by Delea and Selman, (2008) indicated that 84 percent of study participants who were involved in food borne illness outbreaks were those who engaged in complex food handling practices which is common in full service type of restaurants (Delea *et al.*, 2008).

Workers of restaurants with definite and better organized management systems like franchise type restaurants perform better in food safety practice than their counterparts working in restaurants which operate as single entities because of divergence in management systems applied in both situations (Kassa *et al.*, 2010). Other researchers e.g., Green and Selman (2005) and FDA (2001) also found out that management plays a significant role in the extent

to which workers engage in safe food preparation and practices, especially where workers are not supervised closely. Hertzman and Barrash (2007) indicated that an outcome of lack of motivation may also result in poor food safety practice performance.

Demographic characteristics of workers such gender, age, education level, and experience may as well influence their response to various motivators and consequently how they implement food safety programs which eventually impacts on their level food safety practice (Hertzman & Barrash, 2007). Also workers who engage in off-premise catering encounter difficulties in maintaining safety standards when basic factors such as electricity, refrigeration and potable water are not under their control (Hertzman & Barrash, 2007). Off-premise or outside catering is characterized by time and work pressure prompting workers choose to ignore food safety procedure consciously or subconsciously when they are pressurized with work within limited time, also when are not provided with equipment and resource for their work (Hertzman & Barrash, 2007). Ellis et al., (2010) examined the extent to which employees' demographic factors influence their response to the four motivational factors and reported scores which varied according to age gender, education and length of service.

Ombui, Kagiko and Arimi (2001) employed a cross-sectional design to study food borne diseases in forty two districts in Kenya between 1970 and 1993. The objective of the study was to determine the occurrence of food borne disease outbreaks in Kenya and efforts employed to combat them. The outcome measure in the study was the number and aetiological causes of food borne disease outbreaks reported in the study period. Results indicated that thirty seven food poisoning outbreaks were reported by the Ministry of Health from various parts of the country in the study period. They further observed that the major contributors of unsafe food in restaurants and other food service outlets included cross

contamination, under cooking and holding food for a long time at ambient temperatures before consumption and poor personal hygiene.

2.4 Interrelationships between Workers' Knowledge of, Attitude towards and Practice of Food Safety

Knowledge of workers has a bearing on their attitude on food safety (Wie & Strohbelm, 1997, Hsu & Huang 1995). Their study on the impact of sanitation and food safety on attitudes and knowledge of hospitality students revealed that workers attitude toward food safety improves with knowledge. However, they noted that there is still room for more research on the evaluation of the design of food safety training programmes appropriate to restaurant workers.

Hailu et al (2010) noted that it is through food safety training that food service workers are brought to execute proper food handling practices and to serve safe food. Therefore, lack of training of restaurant personnel increases food safety violations in food service facilities.

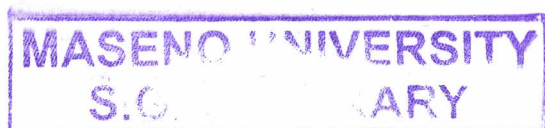
Valerie *et al.* (2009) found that knowledge of food safety should only be part of a larger food safety programme and thus knowledge alone is not sufficient for food safety compliance. In 2002, the UK Food Standards Agency found that 39 percent of 539 managers and non-managerial staff of catering companies in Great Britain and Northern Ireland did not wash their hands after visiting the lavatory. Similarly, 53 percent did not wash their hands before preparing food. While 64% of the managers had a general understanding that employees should wash their hands, only 5 percent of the managers and other staff acknowledged washing hands as something specific to care about in the work place. This indicates that knowledge alone is not adequate to ensure safe food practice. In agreement, Fransh *et al.*

(2006) found that the presence of certified managers does not necessarily increase food safety practice.

Gaps have equally been cited between food safety knowledge and practice of food safety in food service establishments such as restaurants (Lynch, Elldge, Griffith & Boatright, 2003; Mitchel *et al.*, 2007). This is an indication that more research is required to determine circumstances where employees' knowledge regarding food safety has a bearing on their practice of food safety, or whether training of employees on food safety procedures is not necessarily a sure sign of food safety practice

A study by Murat *et al.* (2006) of 764 food handlers in Turkish food businesses in which food safety knowledge, attitudes and practice was evaluated found that a good number of food establishment workers lack knowledge regarding basic food hygiene. Such workers not only lack the awareness of hazards that non-food safety practice poses to consumers but are not also driven to improve food safety (Fairman & Yapp, 2004). The level of knowledge workers of food businesses have on food safety is also associated with compliance of food safety regulations (Roberts & Deery, 2004).

According to Harvey *et al.* (2002), workers attitudes towards food safety vary according to their responsibility. The findings implied that restaurant workers' attitude increases when they are charged with responsibilities. However, Cushman *et al.* (2001) associates length of service with poor performance of food safety, so believe that the longer an employee stays in an organization the poorer he is likely to perform on food safety practice regardless of his responsibility. Thus, the findings from the two studies seem to contradict each other, creating a gap as to what the correct nature of relationship between restaurant employees' attitude and food safety actually is.



Other researchers also hold different opinions regarding the relationship between knowledge of food safety and the actual practice of food safety. According to Ellis *et al.* (2010) knowledge of food handling practices does not always result in actual performance of these practices. Valerie *et al.* (2009) is in agreement and asserts that food safety knowledge should only be part of a larger food safety program and thus knowledge alone is not sufficient for food establishment workers' food safety compliance. Knowledge can only be appropriate if it changes workers' attitude and subsequently their behaviours as regards food safety. In contrast, Nelson and Smith (1999) did reason that lack of food safety knowledge by workers contributes to the prevalence of risk factors of food borne illnesses arising from poor food safety procedures.

According to Lynch *et al.* (2003), knowledge of food safety results in increased levels of awareness of food safety requirements and is therefore an important factor in the realization of safe food in any food establishment. According to Kassa *et al.* (2010), workers who have been exposed to hands-on experience or training normally perform better than those exposed to theoretical concepts of an idea.

A study by Kansas University in the USA in 2000 revealed that attitudes of food service workers toward food safety have a direct effect on food borne occurrences. In their work, the researchers surveyed food service employees whose jobs involved food handling in 31 restaurants across three mid-western states on their attitudes towards food safety measures. The measures included hand washing, use of thermometers and handling food contact surfaces. The study concluded that providing workers with training that does not target attitude may not improve results.

Clayton and Griffin (2007) operationalized the Theory of Planned Behaviour Model posited by Fishbein and Ajzein (2005) and suggested that the attitude of workers impacts on their transfer of knowledge gained through training into practice. This establishes the need to broaden the framework of research on safe food handling behaviour of restaurant workers in relation to their attitude toward food safety.

Restaurant workers' awareness on food safety regulations has a bearing on their food safety practice (Banks, 2003). Banks observed that certain food business operators often do not understand their food safety regulation requirements and thus feel less responsible in identifying and interpreting food safety. Low level education hinders training and there has a negative impact on knowledge, attitude and practice of food safety as observed by Zain and Naing, (2002). Though, certain personal hygiene practices of workers' do not support their knowledge and attitude about food safety (Manning & Snider, 1993).

2.5 Measures towards improving Food Safety

It is important to discuss measures towards serving safe food in restaurants. These measures help in avoiding the occurrence of food borne illnesses. The first step is to ensure that only foods from legitimate sources are served. Serving food from illegitimate sources can influence the likelihood of an outbreak of food borne illness (Sato, 2007). Unsafe food may also result from chemical contaminants in foods such as in milk eggs, meats, vegetables, fish, poultry, and their products, and many other foods may cause allergic reactions to some people (FDA, 2010).

Food should be prepared, cooked properly, served and eaten immediately after its preparation or held at temperatures where pathogens cannot thrive (Ombui, Kagiko & Arimi, 2001). Poor cooking and holding temperature is also a main factor contributing to food borne illness

outbreaks (Todd, 1997). Nott and Hall (1999) also explained that the major purpose of cooking is to increase its palatability, safety and shelf life of food. According to NRAEF (1999), poor time and temperature use occurs when food has been allowed to stand for an extended period of time at a temperature favourable for pathogenic microbial growth. Thus controlling temperatures of food is necessary in ensuring food safety in food service establishments such as restaurants as food borne illness may result from inappropriate temperature used in preparation, cooking and service of food to customers (McSwane *et al.*, 2004). Therefore, temperature measuring devices such as food thermometers, thermocouples and infrared reading should be made use of in determining whether food being prepared is in microbial danger zone or not (McSwane *et al.*, 2004). Improper holding temperature of food may also enhance the growth of certain microorganisms through spores because not all spores will be destroyed with heating processes (McSwane *et al.*, 2004). Storing food at proper temperatures also help eliminate biological hazards. This calls for an investigation of cooking and food holding practices of restaurant workers restaurant workers in Kisumu city.

Avoidance of cross contamination during food preparation, cooking and service is essential in ensuring safe food is served. Cross contamination refers to the transfer of germs from one food item to another and many times this occurs through hands of the food handler, cutting boards, knives, surfaces and other means (Patah *et al.*, 2005). According to Zain and Naing (2002), unhygienic hands and equipment used to prepare raw and cooked food at the same time are the most common media for cross contamination. Food contamination can also result when uncovered raw foods are stored directly adjacent to or above ready to eat foods in a refrigerator or other holding or storage equipment (Zain & Naing, 2002). Djuretic *et al.* (1995) singled out cross contamination as an important contributory factor in outbreaks of food borne diseases. So hand of the food worker should be washed repeatedly because they

are means of food contamination, consequently good personal hygiene and thorough hand washing would reduce the spread of potentially pathogenic transient microorganisms that would otherwise be transferred to customers (Allwood, et al, 2004). A survey conducted by Williamson *et al.* (1992) revealed that 37 percent of food workers would only rinse the knife and cutting board used to cut fresh meat prior to using the same items again to chop fresh vegetables for salad. On the other hand 5 percent of the respondents would simply start chopping the vegetables with the same knife and cutting board and that only 54 percent would wash the knife and cutting board with soap and water prior to chopping the fresh vegetables, giving an implication that only It is necessary to carry out a similar study in Kisumu City where a good number of its population have their meals away from home.

About 20 percent of foods borne illnesses out breaks in the world are due to contamination by the food handler (Zain & Naing, 2002). Food handlers' mistakes contribute to 97 percent of all food borne diseases in food service establishments and the home (Howes *et al.*, 1996; Shewmake & Dillion, 1997) as cited by Clayton and Griffith (2004). In support of Howes, Shewmake & Dillion, Patah *et al.*, (2009) observed that food workers' disregard of the basic food safety rules and regulations results in harmful food.

Noncompliance of food safety procedures by restaurants workers also be attributed to non-commitment to follow procedures because of the temporary nature of their employment brings (De Gilder, 2003). Due to fluctuations in business many restaurants rely on part time or temporary workers whom they invest very little effort in training or providing guidance and support to (Cregar, 1989). In many cases temporary or part time workers are considered less important by employer establishments and thus not worth investing in, in relations of training, because of their high turnover (Foote, 2004). These factors contribute to lack of food safety knowledge, attitude and practice required of restaurant workers. Clayton and Griffith

(2002) indicated that food safety malpractices maybe under- represented in some statistics because epidemiology research does not provide information about the practices of individual food handlers or the underlying causes of food hygiene malpractices them (Hobbs & Roberts, 1993).

2.6 Summary of Knowledge Gaps

Arising from the literature review, workers' knowledge of food safety makes the basis of safe food in restaurants. Many times workers have little understanding of safe food procedures thus food safety in restaurants may not be guaranteed. Motivation of workers and adequate facilities in work places improves their attitude toward food safety. On the other hand, years of service contributes to negative attitude towards food safety. Challenges such as staff turnover and varied menus are also a hindrance in ensuring the safe handling of the various food items in restaurants. Studies revealed that workers attitude toward food safety improve with knowledge. The issues identified in the knowledge gap have not been adequately addressed in Kisumu City and hence the current study.

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CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides information on research design, area of the study, population of the study, sample size and sampling techniques, instruments for data collection, pilot study, validity and reliability of instruments, procedure for data collection and methods of data analysis.

3.2 Research Design

Cross sectional survey design was used in this study. The study design involves data collection from a population, or a representative subset, at one specific point in time and can be used to describe characteristics that exist in a population, but not to determine cause and effects relationships between different variables (Man, 2003). By the use of this design, both quantitative and qualitative data were generated for analysis and interpretation.

3.3 Area of the Study

The study was conducted within the boundaries of Kisumu city. The city, which is the main urban center in Western Kenya and the third largest city in Kenya, is situated close to the Equator in the eastern shores of Lake Victoria (Appendix 4; Map of Kenya Showing position of Kisumu). Kisumu city is the fastest growing urban setup in Kenya, occupying an area of approximately 417 km². It had a population of 396,500 people with 828 people residing in every square kilometre in 2010 (Central Bureau of Statistics, 2010).

In the context of the study, Kisumu city refers to the metropolitan area that is covered by the area within the borders of Ojola, Kiboswa, Miwani and Rabuor centre. (See Appendix 6: Kisumu City boundary bordering Lake Victoria).

3.4 Population of the Study

The study targeted restaurants within Kisumu city with at least 15 workers at the time of data collection. This is because a restaurant with at least 15 workers is considered large (Kenya Tourist Board, 2000). There were a total of 51 restaurants of this type with a total of 1,190 workers.

3.5 Sample size and Sampling Techniques

Sampling is the process of obtaining information about an entire population by examining only a part of it (Kothari, 2012). This is done on the assumption that the sample data will enable the researcher to estimate the population parameters.

In order to select an appropriate sample size from the population, use was made of Creative Research Systems' (2003) formula. The formula is given by:

$$1) \quad SS = \frac{Z^2 p(1-p)}{c^2}$$

Where

SS=sample size

Z=1.96 (for 95% confidence level)

p=percentage picking a choice, expressed as decimal (p=0.5 in this case as this yields the maximum possible sample size required)

c=confidence interval, expressed as a decimal (0.05 in this case giving an interval of ±5).

Subsequent to this, a correction for finite population will be made as follows:

2)

$$New\ SS = \frac{SS}{1 + \frac{SS - 1}{pop}}$$

Where *pop*=population.

The above procedure has gained popularity in survey research and has been used by, for example, Muignani, Packer and Meneghini (2008), and Omondi (2010).

Based on the population under study, the formula generated a sample size of 292 restaurant workers. Proportionate random sampling method was used to ascertain the number of respondents that were interviewed from each of the 51 restaurants. A total of 10 restaurant managers and two public health officers were purposively sampled and engaged in the study as key informants. A response rate of 82% was achieved.

3.6 Instruments for Data Collection

Four instruments for data collection were used in this study. First was a questionnaire administered to restaurant workers (See Appendix 1). The second instrument was a questionnaire administered to restaurant customers (See Appendix 2) and the third one was an interview guide for restaurant managers (See Appendix 3). The following is a description of each of the instruments.

3.6.1 Restaurant Workers' Questionnaire

This questionnaire had four sub-scales measuring restaurant workers' demographics, knowledge of food safety, attitude toward food safety and level of food safety practice. This instrument was adopted from the one that was used by Bas et al., (2004) in a similar study.

Except for the section for demographics, each sub-scale had items constructed using a Likert scale. In this study, a five point scale (5=Strongly Agree, 4=Agree, 3=Neutral, 2=Disagree, 1=Strongly Disagree) was used. The final average score for each of the sub-scales represented the overall level of knowledge of food safety, attitude toward food safety and level of food safety practice.

3.6.2 Interview Guide for Restaurant Managers

The Interview Guide in Appendix 3 was used to interview restaurant managers. It explored on personal views regarding restaurant workers knowledge, attitude and practice in their individual restaurants. The tool comprised of four items in the form of open-ended questions. Probing followed each question and the direction it took depended on the nature of response to the item.

3.6.3 Interview Guide for Public Health Officer

The Interview Guide in Appendix 4 was used to interview the Public Health Officer. It probed on systems employed in ensuring food safety in restaurants by the authorities' concerned and own view on restaurant workers knowledge attitude and practice of food safety in Kisumu city. The tool comprised of four items in the form of open-ended questions. Probing followed each question and the direction it took depended on the nature of response to the item.

3.7 Pilot Study

A pilot study was conducted with restaurant workers who were not part of the final study sample. The study allowed the researcher to identify potential problems with the instruments for data collection. For example, during piloting owing to the sensitive nature of food safety, respondents declined to participate in observation investigation for fear of victimization.

Therefore it was necessary for the researcher to adjust instrument for data collection by excluding observation in the investigation. The piloting also revealed that some items in the likert scale required re-wording in order to make them more comprehensible to the respondents.

3.8 Validity of the Instruments

Content validity of the research instruments was ascertained by my research supervisors. The two supervisors assessed questionnaires and interview guides to verify a match between their contents and the purpose for which they are intended.

3.9 Reliability of Restaurant Workers' Questionnaire

Reliability of the questionnaire used for data collection was ensured by employing an internal consistency reliability test to the data gathered from the pilot study. According to Key (1997), internal consistency reliability test provides an estimate of reliability for a given instrument administration. One such internal consistency test is Chronbach Alpha (α) reliability test, and it was this that was used in this study. Key (1997) defined this coefficient as,

$$3) \quad \alpha = N / (N-1) [1 - \sum \alpha^2(Y_i) / \alpha^2 X]$$

Where N equals the number of items,

$$\alpha^2(Y_i) = \text{sum of items}$$

$$\alpha^2 X = \text{sum of the variance of the total composite.}$$

Coefficient α ranges from 0-1, with values approaching 1 suggesting high reliability and, values approaching 0 suggesting low reliability. It was found that Chronbach's α for the questionnaire used for data collection was 0.5. Thus, the instrument was reasonably reliable

3.10 Methods of Data Analysis

After measuring food safety knowledge, attitude towards food safety practice and safe food handling practice on a five point Likert type scale, scores on negatively stated items were reversed before summarizing the data using means and standard deviations. The mean score for each respondent was reported as a measure of the level of the attribute being measured. The means for food safety knowledge and food safety practice were evaluated based on three categories: below average, average and above average as presented in Table 1. The values were obtained by dividing the 5-point Likert scale which were used to measure the variables from 1=Strongly Disagree to 5=Strongly Agree into three equal parts.

Table 1: Evaluation of means for food safety knowledge and food safety practice

	Below average	Satisfactory	Above average
Food safety knowledge	Mean <2.33	Mean \geq 2.33 but <3.66	Mean >3.66
Food safety practice	Mean <2.33	Mean \geq 2.33 but <3.66	Mean >3.66

Attitude towards food safety was, on the other hand, evaluated in three categories; negative attitude (A mean below 3), neutral attitude (A mean of 3) and positive attitude (A mean above 3).

Findings were reported using tables, graphs and percentages. Pearson's product moment correlation coefficients were also employed to determine the relationship between food safety knowledge of restaurant workers and Practice of food safety as well as the relationship

between attitude of workers towards food safety and food safety practice at an alpha level of 0.05 two-tailed.

3.11 Ethical Considerations

Permission to conduct research was granted by Maseno University. Once the respondents were identified, informed consent was sought from them before questionnaires were administered or before interviews were conducted. Confidentiality was also observed on information provided by the respondents.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND DISCUSSION

4.1 Introduction

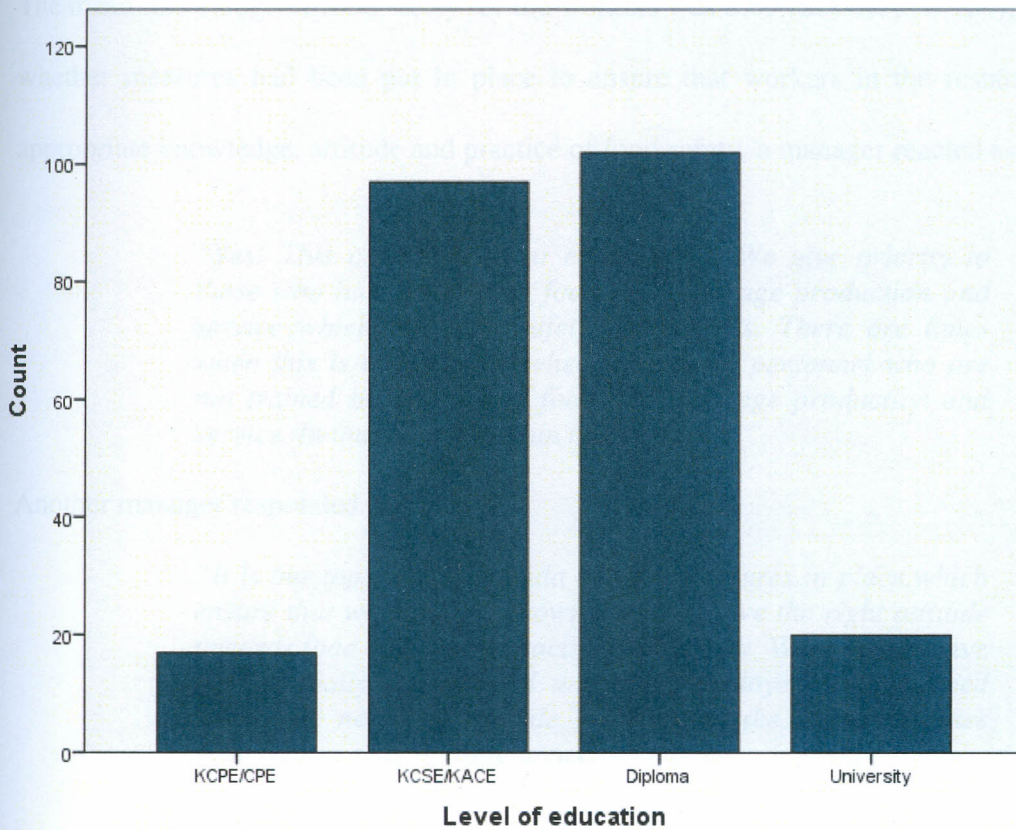
This chapter contains the background information of research participants. Data on workers knowledge of food safety, attitude toward food safety and level of food safety practice in Kisumu city is, analyzed and discussed. Subsequently relationship between the variables used in the study is also presented, analyzed and discussed.

4.2 Background Information on Respondents

The sample consisted of 124 males (53.0%) and 110 females (47.0%). Thus, there were more males than females. Two designations used in the study were Operatives and Managers. One of the respondents did not indicate his/her designation therefore there were 157 known operatives (67.1%) and 77 managers (32.9%). Hence, there were more operatives than managers. The mean age was 28.56 years ($SD^1=6.096$). The median age and modal age were 27 years and 26 years, respectively. The youngest participant was 19 years old and the oldest 58 years old, giving a range of 39 years. This suggests that the majority of restaurant workers in Kisumu City at the time the study was conducted were of middle age. The level of education of respondents used in the study was in five categories, namely, KCPE/CPE, KCSE/KACE, Diploma and University. Any respondent who did not go beyond primary school was placed under KCPE/CPE category. Distribution of respondents by level of education is given in Figure 2. The figure indicates that the highest count consisted of those with Diploma (N=103) followed closely by holders of KCSE/KACE certificate (N=90), KCPE/CPE certificate (N=21) and University degree certificate holders (N=20). Thus,

¹SD=Standard Deviation

predominant categories of level of education for restaurant workers in Kisumu City were Diploma holders, with Degree holders forming the minority group.



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Figure 2: Distribution of respondents by level of education

4.3 Knowledge of Food Safety

The first objective in the study was to establish the level of knowledge of food safety among restaurant workers in Kisumu city across demographic characteristics. In this section, the workers' overall knowledge of food safety, their knowledge of food safety in specific areas, their knowledge of food safety across job category, gender and levels of education, is presented.

4.3.1 Overall Knowledge of Food Safety

The mean knowledge of food safety for the workers was 3.69 (SD=.43, N=234). When asked whether measures had been put in place to ensure that workers in the restaurant had the appropriate knowledge, attitude and practice of food safety, a manager reacted as follows:

“Yes! This comes about at employment. We give priority to those who have trained in food and beverage production and service which has food safety components. There are times when this is not possible when we employ personnel who are not trained in the area of food and beverage production and service. In that case, we train on the job.”

Another manager responded as follows:

“It is our top priority agenda to have measures in place which ensure that workers are knowledgeable, have the right attitude towards food safety and practice food safety. Whereas we have both formally trained and untrained employees, our trained employees normally provide guidance to the untrained ones from time to time in these areas.

4.3.2 Knowledge of Food Safety in Specific Areas

Restaurant workers' mean knowledge of food safety in specific areas is presented in Figure 3.

The graph indicates that in general, restaurant workers were most knowledgeable in the importance of using detergents and sanitizing procedures on utensils and equipment used for storage (Mean =4.37).

not by use of the independent samples *t*-test. The *t*-test showed that the difference between the group means was statistically significant at $\alpha=.05$ ($t_{.95} = 3.44$, $df = 232$, $p < .05$ 2-tailed).

4.3.4 Knowledge of Food Safety in Specific Areas across Designation

An analysis of knowledge of food safety in specific areas across designation showed that Managers were more knowledgeable than Operatives in all areas except three that dealt with storage of food as presented in Figure 4.

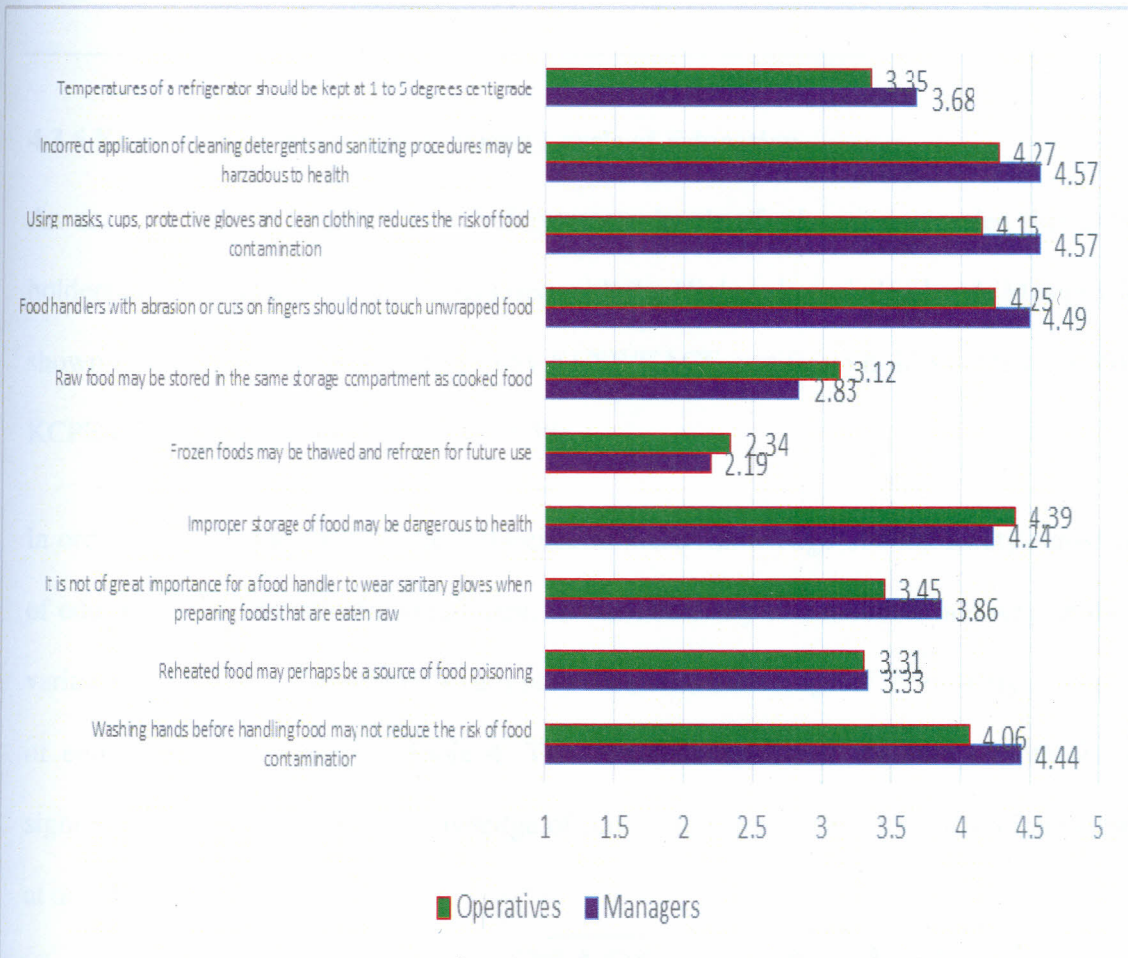


Figure 4: Mean knowledge of food safety in specific areas across designation

4.3.5 Knowledge of Food Safety across Gender

Information from the analyzed data indicated that the mean knowledge of food safety for males was 3.67 (SD=0.45) and that for females was 3.71 (SD=0.41) as shown in Table 3.

Table 3: Mean knowledge of food safety across gender

	Gender	N	Mean	Std. Deviation	Std. Error of Mean
Knowledge of food safety	Male	124	3.67	.45	.04
	Female	110	3.71	.41	.04

4.3.6 Knowledge of Food Safety across Levels of Education

An analysis of knowledge of food Safety across levels of education revealed that Diploma holders and University degree holders tied with the Highest knowledge level (Mean=3.74) as shown in Figure 5. This was followed by KCSE/KACE certificate holders (Mean=3.69) then KCPE/CPE certificate holders (Mean=3.38).

In order to determine whether the difference in mean knowledge of food safety across levels of education was statistically significant, it was necessary to conduct a one-way analysis of variance (ANOVA). The ANOVA summary for mean knowledge of food safety across levels of education is presented in Table 4. The results indicate that the null hypothesis of no significant difference in mean knowledge of food safety across levels of education is rejected at $\alpha=.05$ ($F=4.17, p<.05$).



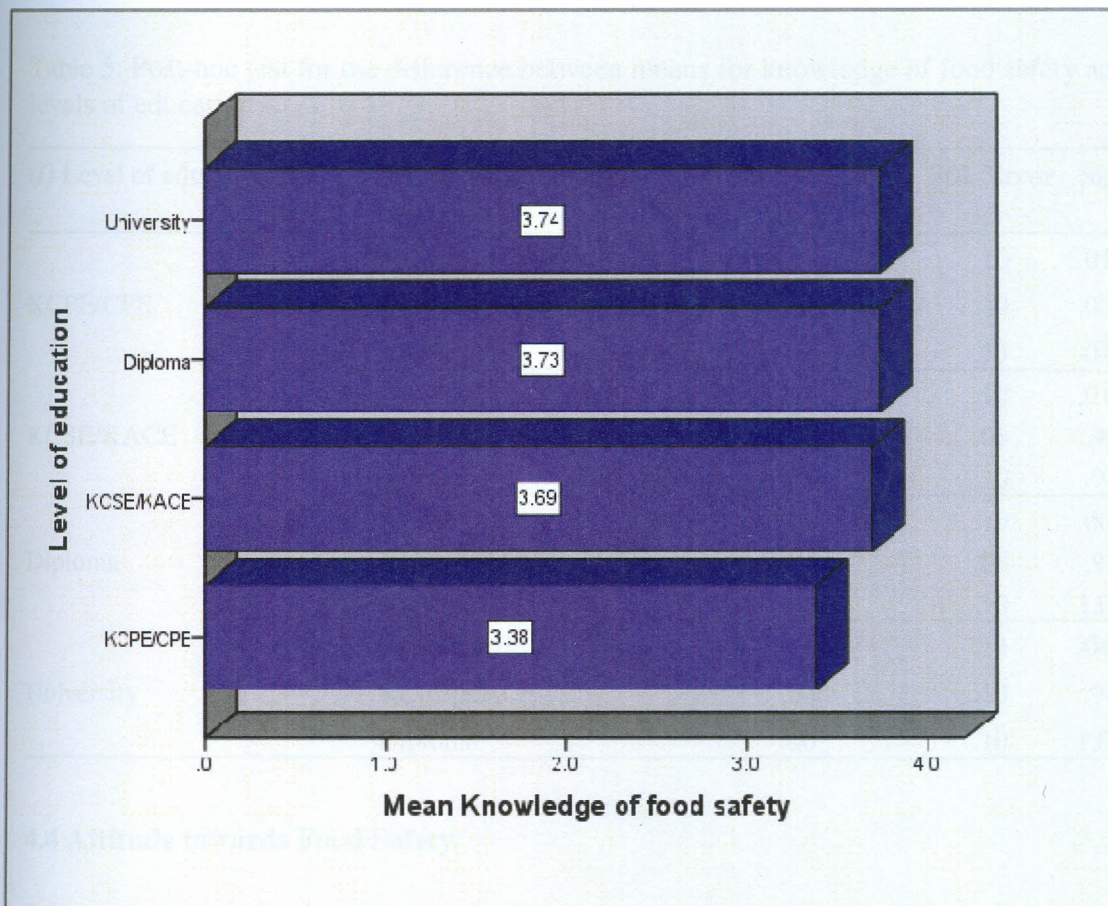


Figure 5: Mean knowledge of food safety across levels of education

Further to the statistically significant overall ANOVA, Tukey's post-hoc test was used to establish which pairs of means were actually different because the analysis had more than two groups. The results are presented in Table 5.

Table 4: ANOVA summary for mean difference in knowledge of food safety across levels of education

Variable	Sum of Squares	df	Mean Square	F	Sig.	
Knowledge of food safety	Between \groups	2.17	3	.72	4.17	.01*
	Within Groups	41.39	228	.18		
	Total	43.58	231			

*The mean difference is statistically significant at .05 level.

Table 5: Post-hoc test for the difference between means for knowledge of food safety across levels of education

(I) Level of education	(J) Level of education	Mean Difference (I-J)	Std. Error	Sig.
KCPE/CPE	KCSE/KACE	-.31	.10	.01*
	Diploma	-.36	.10	.00*
	University	-.36	.13	.04*
KCSE/KACE	KCPE/CPE	.31	.10	.01*
	Diploma	-.04	.06	.90
	University	-.04	.10	.98
Diploma	KCPE/CPE	.36	.10	.00*
	KCSE/KACE	.04	.06	.90
	University	.00	.10	1.00
University	KCPE/CPE	.36	.13	.04*
	KCSE/KACE	.04	.10	.98
	Diploma	.00	.10	1.00

4.4 Attitude towards Food Safety

The second objective of the study was to establish the attitude of restaurant workers in Kisumu city across demographic characteristics. In this section, the workers' overall attitude towards food safety, their attitude towards food safety across job category, gender and levels of education, are presented.

4.4.1 Overall Attitude towards Food Safety

Overall mean attitude towards food safety was 4.14 (SD=.42). In accordance with the predetermined criteria, this indicates that the workers generally had a positive attitude toward food safety.

4.4.2 Attitude towards Food Safety across Designation

Findings showed that the mean attitude towards food safety for operatives was much lower than that of managers as presented in Table 6. This indicates that Managers had more positive attitude toward food safety than Operatives.

Table 6: Attitude towards food safety across designation

	Designation	N	Mean	Std. Deviation	Std. Error Mean
Attitude toward food safety	Operative	157	4.07	.40	.03
	Manager	77	4.30	.43	.05

4.4.3 Attitude toward Food Safety across Gender

In the analysis of attitude toward food safety across gender, findings indicated that the Mean for females was slightly higher than that of males as shown in Table 7. However, the difference was not statistically significant ($t_{.95}=0.303$, $df=232$, $p>.05$).

Table 7: Means and standard deviations for attitude towards food safety across gender

	Gender	N	Mean	Std. Deviation	Std. Error Mean
Attitude toward food safety	Male	124	4.14	.42	.04
	Female	110	4.15	.42	.04

Findings indicated that University graduates and Diploma holders displayed the most appropriate attitude toward food safety compared to KCSE/KACE certificate holders, with CPE/KCPE certificate holders displaying the least appropriate attitude as presented in Figure 6.

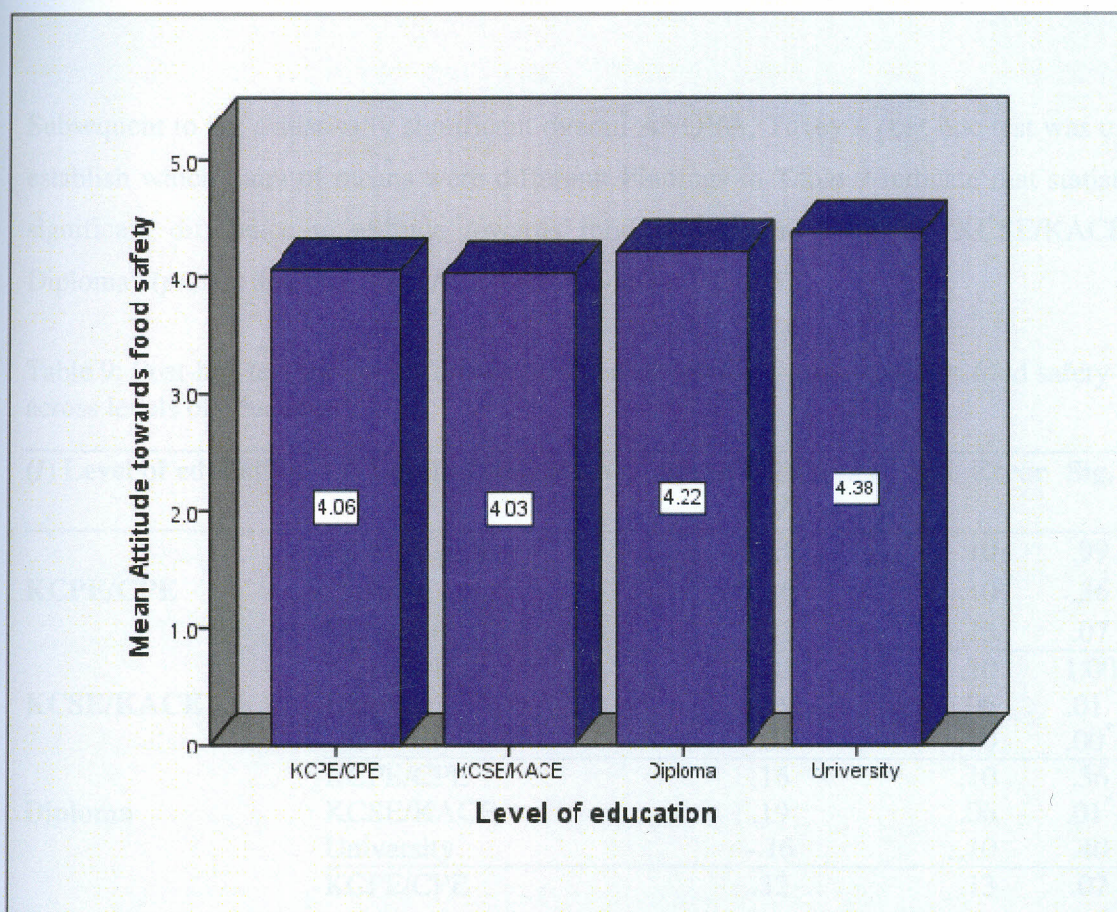


Figure 6: Mean attitude towards food safety across levels of education

4.4.4 Attitude towards Food Safety across Levels of Education

In order to determine which means differed significantly, one-way ANOVA was used as presented in Table 10. The results indicate that the null hypothesis of no significant difference was rejected ($p < .05$).

Table 8: ANOVA summary for mean difference in attitude towards food safety across levels of education

	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	Sig.
Between Groups	2.97	3	.99	5.95	.001*
Within Groups	37.95	230	.17		
Total	40.92	233			

*The mean difference is statistically significant at .05 level.

Subsequent to the statistically significant overall ANOVA, Tukey's post-hoc test was used to establish which pairs of means were different. Findings in Table 9 indicate that statistically significant difference in attitude towards food safety were between "KCSE/KACE and Diploma" ($p < .05$) and "KCSE/KACE and University" ($p < .05$).

Table 9: Post-hoc test for the difference between means for attitude towards food safety across levels of education

(I) Level of education	(J) Level of education	Mean Difference (I-J)	Std. Error	Sig.
KCPE/CPE	KCSE/KACE	.03	.10	.99
	Diploma	-.16	.10	.36
	University	-.32	.13	.07
KCSE/KACE	KCPE/CPE	-.03	.10	1.00
	Diploma	-.19	.06	.01*
	University	-.35	.10	.00*
Diploma	KCPE/CPE	.16	.10	.36
	KCSE/KACE	.19	.06	.01*
	University	-.16	.10	.40
University	KCPE/CPE	.32	.13	.07
	KCSE/KACE	.35	.10	.00*
	Diploma	.16	.10	.40

4.5 Level of Food Safety Practice

The third objective of the study was to establish the level of food safety practice among restaurant workers in Kisumu city. In this section, the overall level of food safety practice, the level of food safety practice of restaurant workers in specific areas, the level of food safety practice across job category, gender and levels of education are presented.

4.5.1 Overall Level of Food Safety Practice

Overall, the mean level of food safety practice was 3.30 (SD=.55). This indicates a satisfactory level of food safety practice among restaurant workers in Kisumu city based on criteria which were set earlier.

When a manager was asked about how he ensured safe food practice by workers, the response was “*The workers’ immediate supervisor takes care of that*”. A key informant expressed the follows view regarding food safety practice in Kisumu city:

“Not all restaurant workers practice food safety fully. That is why we close certain premises. Food safety is practiced to a good extent otherwise we would have all restaurants closed. Few who do not practice to acceptable standards have their licenses withdrawn.”

It is evident from above that some restaurant workers flout food safety rules and such restaurants are normally closed by government authorities.

4.5.2 Food Safety Practice in Specific Areas

Restaurant workers’ mean food safety practice in specific areas is presented in Figure 7. The graph indicates that the most observed food safety practice was hand washing before handling food (Mean=4.45) followed by hand washing every time the type of food to be handled changed (Mean=3.72). The area in which food safety was worst practiced was the use of a thermometer to enable food to be served at the correct temperature (Mean=2.23) followed by wearing of hand gloves when preparing ready to eat foods/drinks even after having washed hands (Mean=2.77).

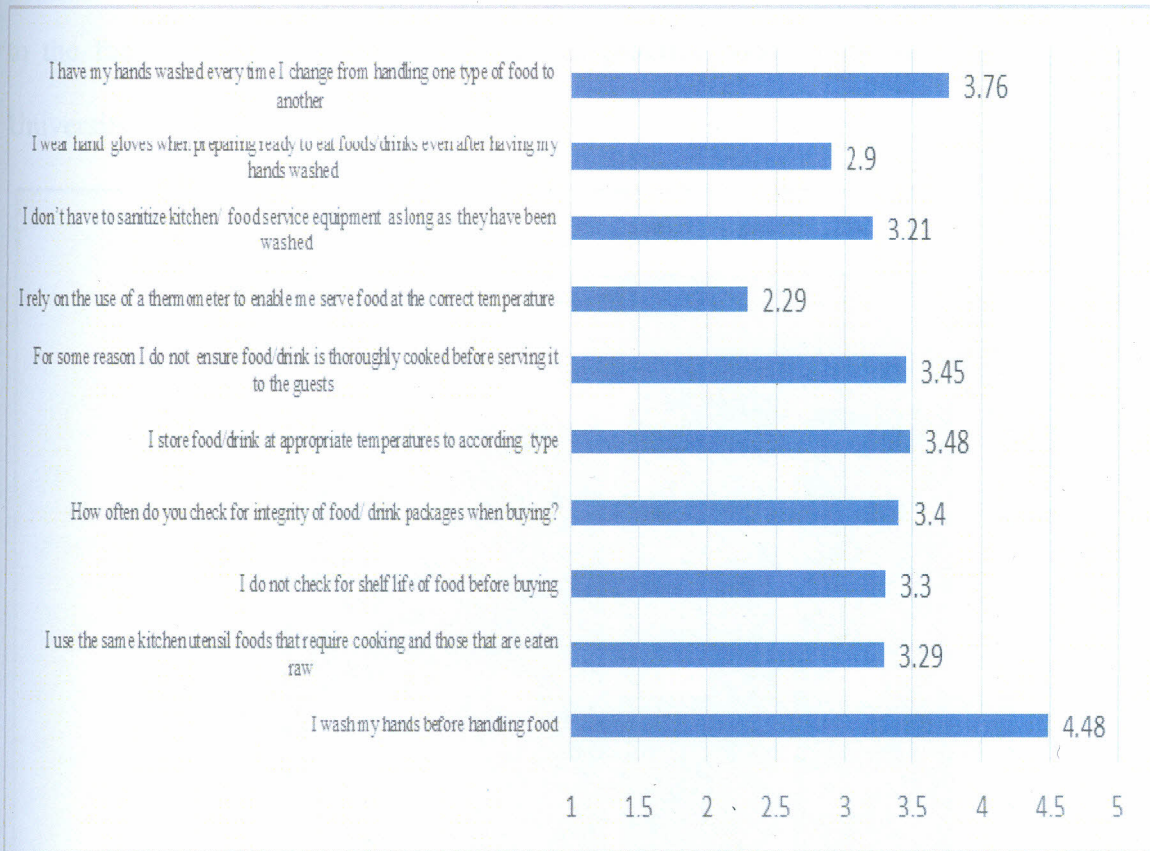


Figure 7: Mean level of food safety practice of restaurant workers in specific areas

4.5.3 Level of Food Safety Practice across Designation

Generally, Managers had a higher mean level of food safety practice than Operatives as shown in Table 10. The statistical significance of the difference between group means was tested using the independent samples *t*-test at $\alpha=.05$ (2-tailed).

Table 10: Means and standard deviation for level of food safety practice across designation

	Designation	N	Mean	Std. Deviation	Std. Error Mean
Level of food safety practice	Operative	157	3.27	.55	.04
	Manager	77	3.35	.56	.06

The results of the *t*-test are shown in Table 11. The results indicate that the null hypotheses of no statistically significant difference in mean levels of food safety practice between

The group with the lowest mean was primary school leavers. However, the findings pointed to the fact that Diploma holders tended to practice food safety skills much better than University graduates.

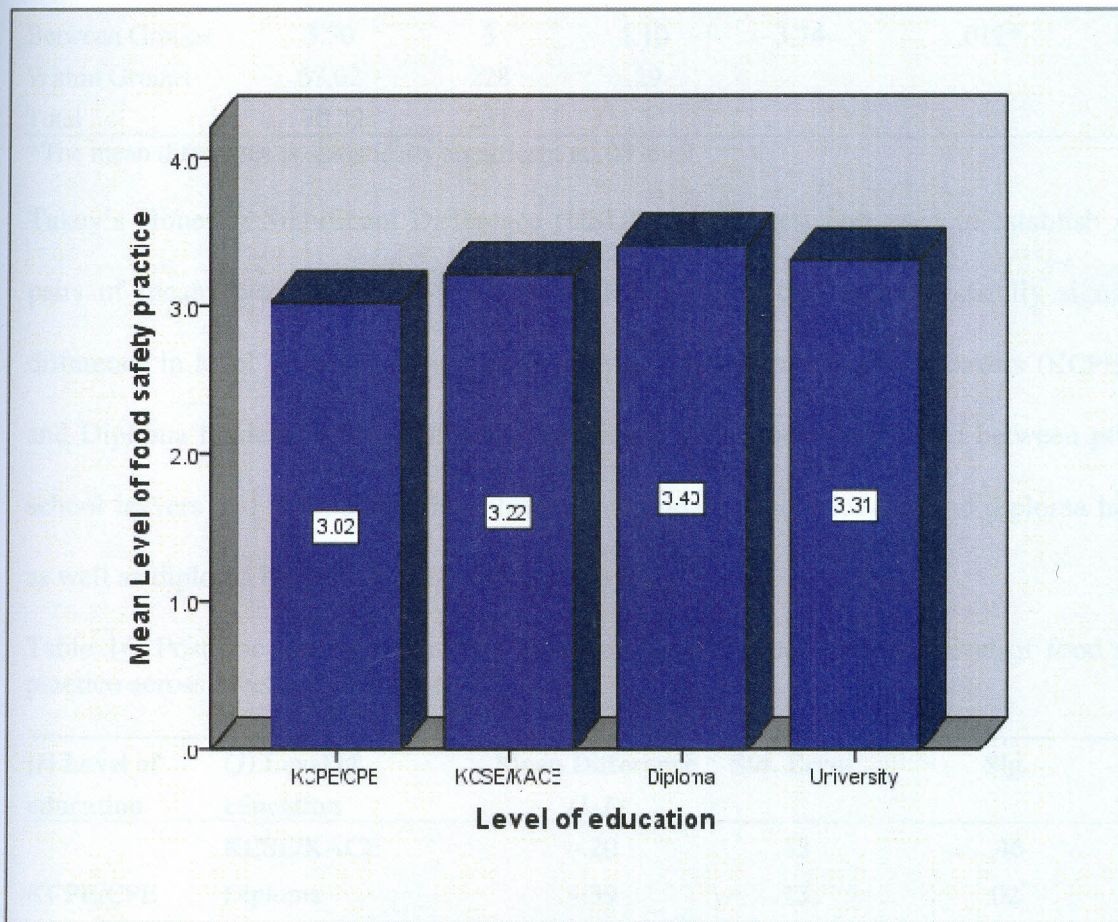


Figure 8: Mean level of food safety practice across levels of education

One-way ANOVA was subsequently used to establish whether the difference between the group means was statistically significant at $\alpha=.05$. The ANOVA summary for the mean difference in level of food safety practice across levels of education is presented in Table 13. The results indicate that the null hypothesis of no significant difference is rejected ($p<.05$). Hence, there were at least one pair of means whose difference was statistically significant. This could only be envisaged by conducting a post-hoc test to establish which pairs of means really differed in the population from which the sample was drawn.

Table 13: ANOVA summary for mean difference in level of food safety practice across levels of education

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.30	3	1.10	3.74	.012*
Within Groups	67.02	228	.29		
Total	70.32	231			

*The mean difference is statistically significant at .05 level.

Tukey's Honestly Significant Difference (HSD) post-hoc test was used to establish which pairs of means were different. Findings in Table 14 indicate that statistically significant difference in level of food safety practice was between primary school leavers (KCPE/CPE) and Diploma holders only ($p < .05$). No significant differences were found between primary school leavers and secondary school leavers, secondary school leavers and diploma holders as well as diploma holders and university graduates.

Table 14: Post-hoc test using Tukey's HSD for the difference in mean level of food safety practice across levels of education

(I) Level of education	(J) Level of education	Mean Difference (I-J)	Std. Error	Sig.
KCPE/CPE	KCSE/KACE	-.20	.13	.46
	Diploma	-.39	.13	.02*
	University	-.29	.17	.33
KCSE/KACE	KCPE/CPE	.20	.13	.46
	Diploma	-.19	.08	.08
	University	-.09	.13	.90
Diploma	KCPE/CPE	.39	.13	.02*
	KCSE/KACE	.19	.08	.08
	University	.10	.13	.89
University	KCPE/CPE	.29	.17	.33
	KCSE/KACE	.09	.13	.90
	Diploma	-.10	.13	.89

*The mean difference is statistically significant at .05 level.

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4.6 Relationship between Knowledge of Food Safety, Attitude toward Food Safety and Food Safety Practice

The fourth objective of the study was to determine the relationship between knowledge of food safety, attitude toward food safety and food safety practice. This was achieved by calculating Pearson's Product Moment Correlation Coefficients between pairs of variables.

Table 15: Correlation matrix for variables used in the study

	Experience (Years)	Age (Years)	Knowledge of food safety	Attitude towards food safety	Level of food safety practice
Experience (Years)	Pearson r	1	.75**	-.05	-.09
	Sig. (2-tailed)		.00	.48	.16
	N	233	230	233	233
Age (Years)	Pearson r	.75**	1	.01	-.01
	Sig. (2-tailed)	.00		.85	.91
	N	230	232	232	232
Knowledge of food safety	Pearson r	-.05	.01	1	.25**
	Sig. (2-tailed)	.48	.85		.00
	N	233	232	235	235
Attitude towards food safety	Pearson r	-.09	-.01	.25**	1
	Sig. (2-tailed)	.16	.91	.00	
	N	233	232	235	235
Level of food safety practice	Pearson r	.10	.17**	.16*	.30**
	Sig. (2-tailed)	.13	.01	.02	.00
	N	233	232	235	235

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Information presented in Table 15 includes Pearson's product moment correlation coefficients. The Table indicates statistically significant correlations were between knowledge of food safety and attitude towards food safety ($r=.25, p<.01$), knowledge of food safety and level of food safety practice ($r=.16, p<.05$) and attitude towards food safety and

level of food safety practice ($r=.30, p<.01$). These findings suggest that as knowledge of food safety improves, so is level of food safety practice and attitude towards food safety. In addition, the relationship between age and level of food safety practice was statistically significant ($r=.17, p<.01$) and the relationship between age and experience was statistically significant ($r=.75, p<.01$). Thus, level of food safety practice and experience increase with age.

4.7 Discussion

In this section, the implication of research findings in the study is discussed. This is done in the context of workers level of food safety knowledge, attitude and practice.

Based on the rating criteria set earlier in this work as shown in Table 1, respondents were found to be generally above average in their knowledge of food safety. The outcome is consistent with the views of restaurant managers who believed that restaurant workers had above average knowledge of food safety. From the interview responses, there was evidence that managers attached a lot of importance in recruiting workers with prerequisite knowledge in food safety. However, where workers did not have the basic knowledge of food safety, on the job training was provided.

The study found restaurant workers to be most knowledgeable in the importance of using detergents and sanitizing procedures on utensils and equipment used for storage (Mean =4.37). This was followed by knowledge of not using fingers with abrasion or cuts as well as the importance of proper storage of food (Mean=4.34). The area in which they had the least knowledge was that frozen foods should not be thawed and refrozen for future use, followed by the knowledge that raw food should not be stored in the same compartment as cooked

food. It is therefore imperative that training institutions should place a lot of emphasis on storage of food as part of the curriculum.

Findings of the study showed that Managers (Mean=3.82) were more knowledgeable than Operatives (Mean=3.62). The outcome is perhaps due to the fact that managers were better trained than operatives, which is consistent with Lynch et al. (2003) who associate food safety training with knowledge of food safety. The better the training, the more knowledge one possesses. A *t*-test also revealed that the difference between the group means was statistically significant at $\alpha=.05$ ($t_{.95} = 3.44$, $df = 232$, $p<.05$ 2-tailed). Therefore, the observed difference in food safety knowledge between operatives and managers was a true difference in the population from which the sample was drawn, and as such could not be attributed to chance or sampling error, with managers displaying more knowledge in food safety than operatives.

An analysis of knowledge of food safety in specific areas across designation showed that Managers were more knowledgeable than operatives in all areas except three that dealt with storage of food. However operatives were more knowledgeable than managers in matters pertaining to storage of food. It is worth investigating this result further to determine reason why restaurant operatives have better knowledge in food storage than manager.

From data analysis mean knowledge of food safety for males was 3.67 (SD=0.45) and that for females was 3.71 (SD=0.41) Thus, female workers on the average tended to display higher knowledge of food safety than their male counterparts. However, based on an independent samples *t*-test, the difference in mean knowledge of food safety between males and females was not statistically significant ($t_{.95}=0.70$, $df =233$, $p>.05$ 2-tailed). Thus, the difference in

knowledge of food safety between male and female restaurant workers may have been an outcome of a chance or sampling error, and not a true difference in the population from which the sample was drawn.

An analysis of knowledge of food safety across levels of education revealed that Diploma holders and University degree holders tied with the highest knowledge level (Mean=3.74). This was followed by KCSE/KACE certificate holders (Mean=3.69) then KCPE/CPE certificate holders (Mean=3.38). In this case knowledge of food safety is a function of level of education, with the exception of Diploma and University levels which do not exhibit any difference in knowledge of food safety.

Results of a one-way analysis of variance (ANOVA) indicated that the null hypothesis of no significant difference in mean knowledge of food safety across levels of education is rejected at $\alpha=.05$ ($F=4.17$, $p<.05$). Further to the statistically significant overall ANOVA, Tukey's post-hoc test established statistically significant differences in knowledge of food safety between three pairs of groups; [1] primary school leavers (KCPE/CPE) and secondary school leavers (KCSE/KACE), [2] primary school leavers (KCPE/CPE) and Diploma holders and [3] primary school leavers (KCPE/CPE) and University degree holders. However there was no statistically significant difference in mean knowledge of food safety was found to exist between university graduates and Diploma holders, University graduates and KCSE/KCE certificate holders as well as Diploma and KCSE/KCE certificate holders at $\alpha=.05$. Any difference between these pairs of means could only be attributed to chance or sampling error. The finding is consistent with that of Zain and Naing (2002) who found that the level of education has a bearing on knowledge acquisition.

The result of a study by Kansas State University in USA (2000) indicated that workers' attitude towards food safety is dependent on the type of training imparted and whether the training targeted attitude or not. Thus, curriculum content during training which includes change in attitude is important if food safety in restaurants is to be enhanced. In the present study, the overall mean attitude towards food safety was 4.14 (SD=.42). In accordance with the predetermined criteria, this indicates that the workers generally had a positive attitude toward food safety. It may also be implied that their training had targeted attitude change.

Findings showed mean attitude towards food safety for operatives was much lower than that of Managers. This indicates that managers had more positive attitude toward food safety than operatives. This finding is consistent with the views of Harvey et al. (2002) and Cushman et al. (2001) that more senior workers had more positive attitude towards food safety than their juniors. An independent samples *t*-test produced a statistically significant difference between the two group means ($t_{.95}=4.06$, $df=232$, $p<.05$ 2-tailed). This implies that in the population from which the sample was drawn, managers' attitude towards food safety was different from that of operatives, and such a difference could not be attributed to chance or sampling error.

In the analysis of attitude toward food safety across gender, findings indicated that the mean for females was slightly higher than that of males. However, the difference was not statistically significant ($t_{.95}=0.303$, $df=232$, $p>.05$). Therefore, any difference in attitude towards food safety between male and female restaurant workers may be have been a chance phenomenon or an outcome of sampling error.

University graduates and Diploma holders displayed the most appropriate attitude toward food safety compared to KCSE/KACE certificate holders, with CPE/KCPE certificate holders displaying the least appropriate attitude. The results show an association of attitude of

workers towards food safety with their level of education. An implication to this is that higher the level of education of restaurant workers the better the attitude toward food safety. The mean difference in attitude toward food safety was statistically significant across levels of education. ANOVA, Tukey's post-hoc test establish indicated that statistically significant difference in attitude towards food safety were between "KCSE/KACE and Diploma" ($p<.05$) and "KCSE/KACE and University" ($p<.05$).

Overall, the mean level of food safety practice was 3.30 (SD=.55) which indicated a satisfactory level of food safety practice among restaurant workers in Kisumu city based on criteria which were set in earlier. Considering that mean knowledge of food safety for the workers was 3.69, this finding is consistent with that of Ellis et al (2010); that knowledge of food safety does not always result in actual performance of these practices. This result would be worthy for further investigation as mentioned earlier.

When a manager was asked about how he ensured safe food practice by workers, the response was "*The workers' immediate supervisor takes care of that*". A key informant expressed the follows view regarding food safety practice in Kisumu city:

"Not all restaurant workers practice food safety fully. That is why we close certain premises. Food safety is practiced to a good extent otherwise we would have all restaurants closed. Few who do not practice to acceptable standards have their licenses withdrawn."

It is evident from above that some restaurant workers flout food safety rules and such restaurants are normally closed by government authorities. This is clearly at variance with the views of restaurant managers documented earlier.

Restaurant workers' mean food safety practice in specific areas indicates that the most observed food safety practice was hand washing before handling food (Mean=4.45) followed by hand washing every time the type of food to be handled changed (Mean=3.72). The area in which food safety was worst practiced was the use of a thermometer to enable food to be served at the correct temperature (Mean=2.23) followed by wearing of hand gloves when preparing ready to eat foods/drinks even after having washed hands (Mean=2.77).

Generally, Managers had a higher mean level of food safety practice than operatives. The results of the *t*-test indicate that the null hypotheses of no statistically significant difference in mean levels of food safety practice between operatives and managers was retained ($p > .05$). Therefore, in the population from which the sample was drawn, any differences in levels of food safety practice across job category was just an outcome of chance or sampling error.

In general, females tended to demonstrate higher levels of food safety practice than males as displayed. However, based on independent samples *t*-test for two groups, the difference in mean levels of food safety practice across gender was not statistically significant, and any such difference was purely an outcome of chance or sampling error ($t_{.95} = 0.47$, $df = 232$, $p > .05$, 2-tailed).

Diploma holders had the highest mean level of food safety practice followed by University graduates, KCSE/KCE certificate holders and KCPE/CPE certificate holders, in that order. The group with the lowest mean was primary school leavers. However, the findings pointed that Diploma holders tended to practice food safety skills much better than University graduates a fact that should be investigated further.

The ANOVA summary for the mean difference in level of food safety practice across levels of education points out that the null hypothesis of no significant difference is rejected ($p < .05$).

Hence, there was at least one pair of means whose difference was statistically significant. Consequently Tukey's Honestly Significant Difference (HSD) post-hoc test indicate that statistically significant difference in level of food safety practice was between primary school leavers (KCPE/CPE) and Diploma holders only ($p < .05$). No significant differences were found between primary school leavers and secondary school leavers, secondary school leavers and diploma holders as well as diploma holders and university graduates.

The fourth objective of the study was to determine the relationship between knowledge of food safety, attitude toward food safety and food safety practice. This was achieved by calculating Pearson's Product Moment Correlation Coefficients between pairs of variables. The information indicates that statistically significant correlations were between knowledge of food safety and attitude towards food safety ($r = .25, p < .01$), knowledge of food safety and level of food safety practice ($r = .16, p < .05$) and attitude towards food safety and level of food safety practice ($r = .30, p < .01$). Therefore according to this study, more knowledge of food safety is associated with higher levels of food safety practice and vice-versa, and this finding is consistent with that of McIntosh et al. (1994), Lynch et al. (2003), Jacob, (1989) and Hailu et al. (2010). However, the results are in contrast to Ellis et al. (2010) who found that knowledge of safe food handling practices does not always result in actual performance of these practices. The information also shows that positive attitude toward food safety is associated with more knowledge of food safety and positive attitude toward food safety is also associated with higher levels of food safety practice and vice-versa.

The finding that the more positive one's attitude toward food safety is, the more knowledge about food safety is consistent with the findings of Wie and Strohbelm (1997) and Hsu and Huang (1995). Findings that knowledge of food safety and level of food safety practice also increases with attitude are similar to the views of Almanza and Nesmith (2004) that workers'

knowledge of food safety proposes compliance to food safety requirements. However, the finding contrasts that of Lynch et al. (2003) and Valerie et al (2009) who found that a high level of food safety knowledge may not necessarily imply a high level of food safety practice, and argued that knowledge alone is not sufficient for workers' food safety compliance and thus should only be part of a larger program. This suggests a need for a study to isolate cases where workers food safety knowledge does not imply positive attitude or practice and visa versa. The area in which restaurant workers had least knowledge was that frozen foods should not be thawed and refrozen for future use, followed by the knowledge that raw food should not be stored in the same compartment as cooked food.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of findings of the study as obtained from the analysis of the data collected. It also gives conclusions reached from the study as well as recommendations and suggestions for further research.

5.2 Summary of Findings

There were five objectives of this study. These were:

- i. To find out the level of food safety knowledge among restaurant workers in Kisumu City.
- ii. To establish the attitude of restaurant workers toward food safety in Kisumu City.
- iii. To ascertain the level of food safety practice among restaurant workers in Kisumu City.
- iv. To determine the inter-relationships between food safety knowledge, attitude and practice among restaurant workers in Kisumu City.

Data collected and analyzed indicated that restaurant workers in Kisumu city have above average knowledge of food safety and a positive attitude regarding food safety. However, the workers displayed a satisfactory level of food safety practice.

Further to the above, operatives and managers differed in their knowledge of food safety, with managers displaying significantly more knowledge than operatives. However, operatives

appeared to be more knowledgeable than managers in specific matters pertaining to storage of food.

Gender difference in knowledge of food safety was not statistically significant. There was also no statistically significant difference in knowledge of food safety between University graduates, Diploma holders and KCSE/KCE certificate holders.

Restaurant workers had a positive attitude toward food safety, with managers having more positive attitude toward food safety than operatives. No significant difference in attitude toward food safety between males and females was found. Statistically significant difference in attitude towards food safety was between KCSE/KACE and Diploma holders and KCSE/KACE and University certificate holders.

The level of food safety practice among restaurant workers in Kisumu was satisfactory, with managers exhibiting significantly higher levels than operatives. However, the difference between means in level of food safety practice across designation as well as across gender was not statistically significant. Statistically significant difference in level of food safety practice was between primary school leavers (KCPE/CPE) and Diploma holders only.

The study also revealed that knowledge of food safety, attitude towards food safety and level of food safety practice were positively correlated. This means that as restaurant workers' knowledge of food safety increases, so is their level of food safety practice. Similarly, as their knowledge of food safety increases, their attitude toward food safety becomes more and more positive. Lastly, as their level of food safety practice rises, so is their attitude toward food safety.

5.3 Conclusion

The study concludes that in general, restaurant workers in Kisumu city were knowledgeable in food safety and have a positive attitude towards food safety. However, their level of food safety practice was only average. In addition, the fact that knowledge, attitude and level of food safety practice were related underscores the importance of these variables in food safety training.

5.4 Recommendations

The central idea of this study was to investigate restaurant workers knowledge attitude and practice in an effort to improve service of safe food in restaurants in Kisumu. In light of the findings and conclusions of the study, it is recommended that;

- i. Managers of restaurants in Kisumu city should train workers from time to time to assure the customers of safe food provision.
- ii. Managers of restaurants should liaise with hospitality training institutions to improve on food safety practice within Kisumu city.

5.5 Suggestions for Further Research

The following are suggestions for further research:

- i. A similar study with more participant observation should be carried out which takes into account the observable hygiene practice of workers.
- ii. There is need to investigate management systems with respect to Hazard Critical Control Points (HCCP) applied in restaurants in Kisumu city.



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