Attitudes, knowledge and food safety awareness of food handlers and consumers in the hospitality industry

by

PRECIOUS MAVIS THULILE MNGOMA

Submitted in accordance with the requirements

for the degree of

MASTER OF CONSUMER SCIENCE

at the

UNIVERSITY OF SOUTH AFRICA

SUPERVISOR: PROF. JJ SIBANYONI

CO-SUPERVISOR: DR D BESWA

MAY 2022

DEDICATION

This study is dedicated to my mother Ms. Fikile Salvatoris Mabida for instilling the importance and love of education, giving her all towards my education needs. I would also like to dedicate this dissertation to my husband Mr. S. Mngoma and my two sons Nhlanganiso and Luthando Mngoma for their endless support and encouragement. Finally, my two gorgeous fountains of love and support Mngoma and Mabida families, you always make me complete.

DECLARATION

I Precious Mavis Thulile Mngoma, student number 5302807, hereby declare that the dissertation, with the title: Attitudes, knowledge and food safety awareness of food handlers and consumers in the Hospitality Industry which I hereby submit for the degree of Master of Consumer Science (Full Dissertation) (98014) at the University of South Africa, is my own work and has not been submitted by me for a degree at this or any other institution.

I declare that the dissertation does not contain any written work presented by other persons whether written, pictures, graphs, or data or any other information without acknowledging the source.

I declare that where words from a written source have been used the words have been paraphrased and referenced and where exact words from a source have been used the words have been placed inside quotation marks and referenced.

I declare that I have not copied and pasted any information from the Internet, without specifically acknowledging the source and have inserted appropriate references to these sources in the reference section of the dissertation.

I declare that during my study I adhered to the Research Ethics Policy of the University of South Africa, received ethics approval for the duration of my study prior to the commencement of data gathering, and have not acted outside the approval conditions.

I declare that the content of my dissertation has been submitted through an electronic plagiarism detection program before the final submission of examination.

Student signature: 

Date: 09/12/2021

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to God Almighty for wisdom, strength, and ability to pull through to the finishing line above all circumstances. Without Him by my side, I would never have come this far.

I wish to express my heartfelt gratitude to the following individuals for their enormous contribution, support and guidance towards the completion of this project:

- A special word of gratitude to my supervisor, Prof. J.J. Sibanyoni for being a great motivator, mentor and constant voice of encouragement. I am truly grateful to have such a remarkable passionate supervisor.
- Dr. D Beswa for great support and guidance from the onset until the end. I am humbled by the timely advice provided throughout the progress of this research study.
- Hospitality establishments in the Umhlathuze Municipality for opening doors, granting permission to interact with managers, supervisors, food handling staff members and consumers who became participants in the study.
- The University of South Africa, Research Department for funding this research project, and without the substantial funding I received I would not have gone this far.
- My mother, Fikile Mabida for continually being there when I needed you most, and my entire family, thank you for your support through thick and thin.
- To my numerous friends, thank you for pushing me every day to do my best to complete this study.
- Saving best for last, my greatest thanks and admiration to my husband and confidante Mr. S. Mngoma, Dube! *Ngiyabonga*, for the never-ending love and support you blanket me with every day. My two inquisitive sons, Nhlanganiso and Luthando Mngoma, thank you for understanding that mommy is also a student and for the overflowing cups of coffee you served me during my studying time, I am holding onto those memories.
- I am eternally grateful to everyone who made me who I am.

ABSTRACT

Food-borne illnesses are a global concern affecting the foodservices industry. Like other eating establishments, the hospitality industry is prone to foodborne illnesses. Food safety knowledge and awareness pose potential hazards when food is not prepared hygienically, and several campaigns have launched a reduction to the burden of food-borne diseases. This study aims to measure food safety attitudes, knowledge and awareness in the hospitality industry based on the uMhlathuze Municipality in KwaZulu-Natal, South Africa. The research design was cross-sectional and quantitative. It was designed to measure levels food safety practices within the hospitality industry to fight against food-borne illnesses. Respondents were individuals who are 18 years or more, employed and making use of services offered in the hospitality establishments. A total size of study was 101 managers, 110 food handlers, and 170 consumers and were randomly selected to participate in the study. Respondents were invited to participate having signed informed consent. The data was collected through self-administered questionnaires with sub-sections targeting managers, food handlers, and consumers eating food prepared out of the household. Data was analysed using SPSS version, cross tabulations and Chi-square tests of $p<0.05$ were done. Graphs and tables were used to graphically represent the data. The results showed that, 66% of food handlers had good food safety knowledge and awareness. Seventy-five percent of consumers had knowledge of the importance of food safety. Less than half (38%) of managers ensured to monitor food safety but through hygiene policies and procedures complied to food safety.

This study revealed the existence of a reasonable gap in food safety knowledge and awareness within the hospitality industry and attention is needed on temperature monitoring and the development of food safety policies and procedures to prevent the occurrence of food-borne diseases outbreaks and improved consumer food safety awareness within the hospitality industry.

Keywords: Food safety, hospitality industry, food safety knowledge, food safety awareness, food handlers, managers and customers

Table of Contents

LIST OF TABLES

LIST OF FIGURES

1. CHAPTER 1: INTRODUCTION

1.1 Background of the study

Rogerson, 2013 elucidates the hospitality sector in South Africa to possess a giant foodservice market in the Southern region of Africa, with highly ranked catering services for increasing numbers of travelers visiting the country for business and leisure purposes. The industry is broad, segmented into food, alcoholic, non- alcoholic beverages services, travel, tourism, lodging and recreation services. In comparison to other services, food and beverage plays a fundamental role counting to a more significant portion, in comparison to hotels, sit-in restaurants, fast-casual restaurants, chained restaurants, clubs, lounges, lodges, guesthouses and bars. Hospitality and tourism sectors contribute excellent profit for the country from a large range of personal and social events attracting “leisure” travelers (Gursoyard & Sandstrom, 2016). The sector provides prepared food in hotels, pubs, restaurants through contracted caterers as well as fast food takeaways. In 2017, South Africa received more than 10 million visitors during the holiday season. The fast-growing hospitality industry also increases the chances of consumers eating away from home, increasing the demand for safety in food consumed.

In general, globalisation of the world’s food trade, rapid urbanisation, population growth, and change of eating habits triggers increased consumer demand. It is to be provided with a wider variety foodservice outlet to meet consumer demand. As the world population grow economic opportunities are created, the food industry knowledge, and awareness become challenged within the sector, posing potential risks, especially on unhygienic preparations.

Incidences of outbreaks are estimated to be increasing in some developing countries. The inadequate mandatory surveillance and reporting systems are ineffective to capture numbers of estimated cases available in developing countries (Ansari *et al*., 2013). The majority of food-borne cases remain unreported to health officials, and information sharing between regulatory bodies is virtually absent, affecting awareness about food-borne diseases (Manning, 2018). The increased food -borne infectious diseases are contributed by lack of consciousness in food safety contributed by contaminated products and hazards, maximising food-borne outbreaks and diseases risks. Globally, 95% of

food-borne diseases are triggered by diarrhea diseases agents, and unsafe food consumption results from foodborne disease outbreaks worldwide (WHO, 2015).

Recent outbreaks in food-borne illnesses, is directed towards foodservice workers' health, wellness, cross-contamination, improper hygiene, and all aspect of operation in food preparation (Angelo *et al*., 2016; Brown *et al*., 2017). The link between food handlers, consumers and food also contributes to outbreaks. The incidences of outbreaks may be minimized by continuous food safety education, increased food safety knowledge and proper supervision within hospitality establishments (Arendt *et al.,* 2013). Similar, Adesoken *et al*. (2015) recommended ongoing training and behavior change on food handling to increase food safety knowledge. The majority of studies on food safety knowledge, and awareness are piloted in hospitals, institutions, schools, and a few in the South African hospitality industry. This study determines basic food safety knowledge and awareness are limited to hospitality industry.

1.2 Statement of the problem

Unsafe food creates a vicious cycle of contamination and substantial consumer illness within the South African hospitality industry (Frenserbush, 2018). In the 21st century, food-borne diseases pose a global health concern in the food industry. Similar to other eating establishments, the hospitality industry is recorded with many incidences linked to food-borne outbreaks and diseases. In most instances, majority incidences are from meals taken away from home and consequently risk exposure to food-borne illnesses. Challenges in food safety contribute to a range of illnesses caused by consumption of foodstuffs contaminated biologically (which is linked to bacteria, microorganisms, or toxins), chemicals (directly or indirectly added to the food product), and physical (which involves contamination occurring during processing and packaging (Purnomo, 2014). The food chain occurs between food production and distribution (“farm to fork”). Furthermore, illnesses are caused by food improperly handled and prevention is dependent on the main source of course, manufacturing and storage (Shonhiwa *et.al*., 2017).

Food contamination is mostly contributed by improper food handling, lack of safety management practices (Tegegne & Phyo, 2017; Purnomo, 2014). The other food contamination factors relate to inadequate facilities, a lack of proper sanitary conditions,

inactive management, and lack of training as well as the misuse of government regulations and laws in establishments (Onyeneho & Hedberg, 2013). The other factors contributing to outbreaks are inadequate cooking, lack of kitchen or processing equipment cleaning, consumption of contaminated raw food (Casigena, 2016). Cross-contamination contributes to many food outbreaks and occurs during food preparation, touching cooked meat, and preparing raw vegetables without washing hands between tasks (Zeeshan *et al.*, 2017). The hospitality sector is not different from other sectors in South Africa when it comes to the challenges of reporting and recording cases contributing to outbreaks within registered food premises. The lapse of food safety results in consumers becoming ill, hospitalised, prosecuting food businesses.

Hence this study aims to identify attitudes, knowledge and food safety awareness of food handlers and consumers in hospitality establishments of uMhlathuze Municipality, KwaZulu-Natal. This research may develop food safety practices to benefit food handlers and managers in the hospitality industry. The results may further be used on enforcing reduction and reoccurrences of food-borne outbreaks within the hospitality industry and proper food safety practices protect consumers. The results may also serve as motivation for the use of HACCP program to monitor food control and contribution towards protecting consumers from food hazards.

1.3 Significance of the study

Purnomo, 2014 stated that “food-borne illnesses are identified as diseases resulted by ingestion of contaminated food or beverages”. In order to avoid diseases, it is consequential ensuring proper food safety practices and enforcement food safety policies and regulations necessary. This study seeks to provide knowledge that can be used to ensure food safety and also prevention of food insecurities in the hospitality industry to meet consumer food safety demands. Furthermore, in articulating the hospitality industry, the study set to close food safety gap especially on monitoring and encourage co-operation through food safety management systems. The recommendations of this study further contribute to future documents of policies with comprehensive food safety. The findings will contribute to offerings of safe food products within hospitality establishments,

and food safety procedures to preventing future incidences relevant to future studies. The integration of Hazard Analysis Critical Control Point (HACCP) application in all hospitality establishments as a tool in place to guard against safe food practices and prevent cross-contamination will be encouraged for usage. This study aims to provide support in the implementation of HACCP in food preparation to improve food safety.

1.4 Study aim and objectives

1.4.1 Aim

The main focus of this research was to investigate attitudes, knowledge and food safety awareness as means to prevent food borne diseases in hospitality establishments based in Umhlathuze Municipality, KwaZulu-Natal.

1.4.2 The objectives of the study

The objectives of this study are:

- To determine food safety knowledge of food handlers in hotels and restaurants of the uMhlathuze Municipality, KwaZulu-Natal.
- To determine food safety awareness of food handlers in hotels and restaurants of the uMhlathuze Municipality, KwaZulu-Natal
- To determine food safety attitudes of consumers when purchasing food items in the hospitality industry in uMhlathuze Municipality, KwaZulu-Natal
- To determine consumers' awareness of when purchasing ready-to-eat food hotels and restaurants in uMhlathuze Municipality, KwaZulu-Natal
- To determine the management's commitment to food safety in hotels and restaurants in uMhlathuze Municipality, KwaZulu-Natal.
- To test for correlation between categorical variables.

1.5 Research questions

This research will attempt to answer the following research questions:

- What is food handler's knowledge of food safety?
- What is food handler's awareness of food safety?
- What is consumers' awareness of food safety?
- How are consumers evaluated in food safety, when making food purchases?
- What are the tools used to measure the available level of knowledge and awareness based on food safety?
- What safety measures are in place to obtain manager's commitment?
- How is test conducted for correlation between categorical variables?

1.6 Conceptual framework

The theoretical framework presents different variables, food safety criteria, factors, and related processes to ensure awareness. The criteria accommodate knowledge, awareness, and operation standards for hospitality establishments. The conceptual framework is summarised parallel to food safety challenges and recommendations. To work towards reducing mentioned risks of food-borne illnesses, a guide is provided in the framework below (Figure 1.1). The impacts represent risks to identify different perceptions of food safety knowledge and awareness.

Food safety management is guided by policies together with the establishment's objectives. According to different scholars, managers, or supervisors these are key role players in the industry to commit or ensure that food safety aimed by an establishment is adhered to. Food safety policies adopted by companies and food plans are to be communicated to all stakeholders as means in place not to compromise food safety in foodservices (Arendtel *et al*., 2014).

Food safety's primary implementers are food handlers who have a responsibility to ensure proper personal hygiene with high emphasis made on handwashing (Matheus *et al*., 2014). Future food handlers have a duty to close the gap created by other researchers through focusing on minimising food-borne incidences.

Previous studies on food-borne illnesses revealed inadequate food handler's knowledge (Abdullah & Siow, 2014; Ansari-Lari, Soodbakhsh & Lakzadeh, 2010). Foodservice

establishment practices of food handlers suffer lawsuits when compromising the health of food consumers. Food handlers ensure that kitchen hygiene, appropriate food temperatures and prevention of cross-contamination are taken into consideration during food preparation to contribute to consumer safety. Food products prepared by food handlers in a safe food preparation environment increase consumer satisfaction and profits in the hospitality industry. Sufficient training is necessary among culinary students before becoming food handlers. Emphasis on food safety maintenance is done through ongoing training (Abdullah & Siow, 2014).

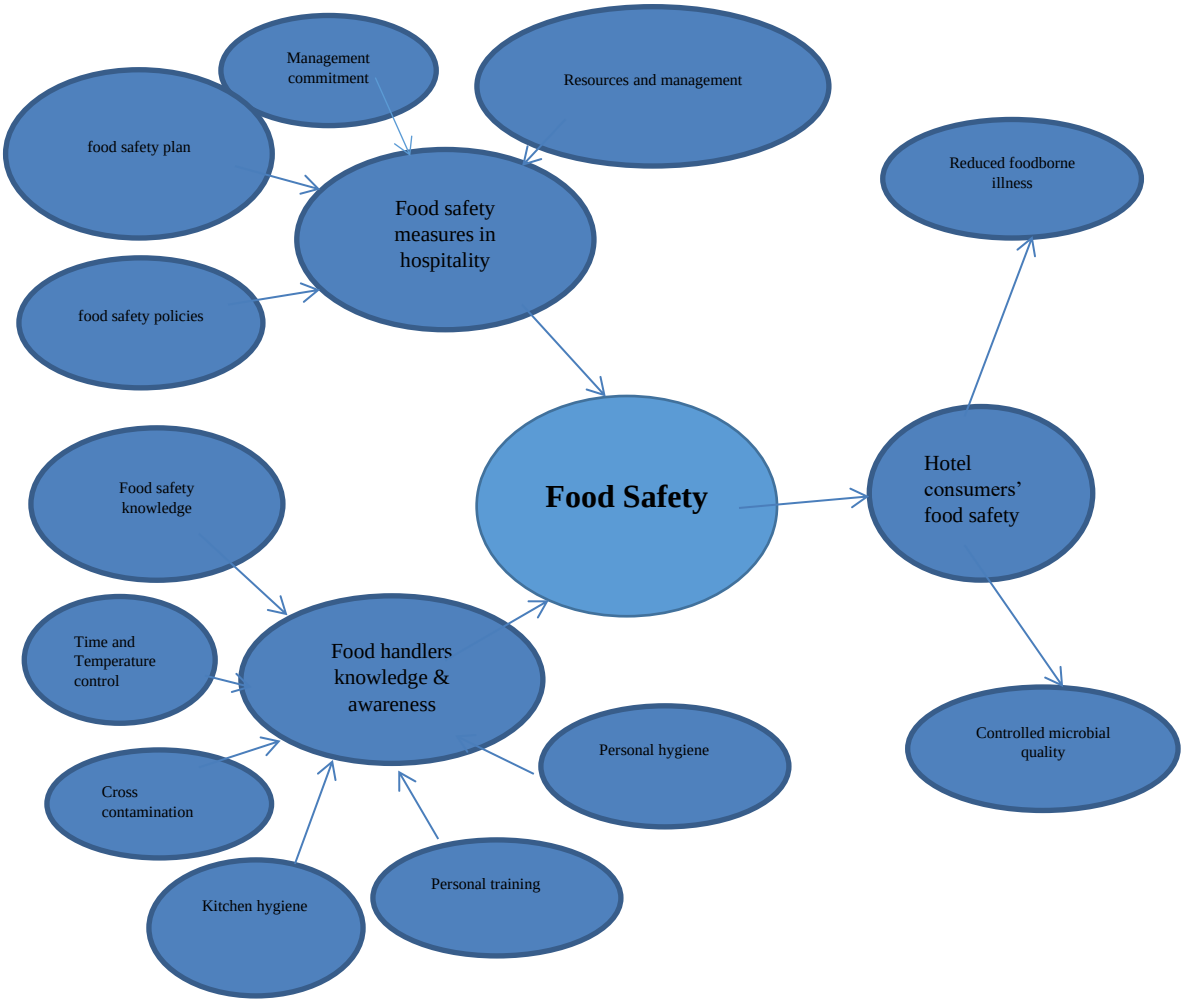

Figure 1. 1: Conceptual framework, attitudes and food safety awareness of food handlers and consumers in the hospitality industry

1.7. Layout of the Dissertation

This study comprises of seven chapters outlined and arranged as follows:

Chapter 1: Introduction

This introductory chapter provides basic principles of the study and background context. It further outlines the problem statement, the purpose of the study, aims, objectives and explanation of layout for the study.

Chapter 2: Literature Review

The reviews in Chapter Two provide a summary of existing literature on food safety knowledge, practices and awareness, food control authorities, managers and food handlers roles in food management, and food safety training in the hospitality industry. It also covers food-borne outbreaks and diseases.

Chapter 3: Research Methodology

This research area, target population, sampling method and data collection instruments used were outlined in this chapter. The ethical principles followed, and limitations were briefly described.

Chapter 4: Research Results

The research approaches new findings result of the study from the questionnaires presented to various respondents participating in hospitality foodservices.

Chapter 5: Discussions

A comprehensive discussion of the results of the participants' variables of sociodemographic data, personal hygiene, microbial hazard and foodborne diseases, temperature control affecting respondents is provided. It also outlined levels of knowledge, awareness and attitudes of respondents. Further discussions are on results of analysis of variance (ANOVA) was also provided. In this chapter.

Chapter 6: General Conclusion and recommendations

The section summarises the findings of the study in line with the set objectives and conclusions. The overall conclusion and recommendations for improvement are provided.
.

Chapter 7: References

This section provides a list of references and appendices for the dissertation.

2. CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Worldwide, food safety remains a responsibility for all food handlers and managers involved in food preparation areas to prevent food-borne illnesses. Food-borne illnesses involving many consumers are perceived as a health issue. This chapter covers the literature on food safety, knowledge and awareness in the hospitality industry. The main focus is to guarantee food safety in hospitality industry, prevention of food-borne diseases, identify food control authorities, management systems are also discussed in this chapter.

2.2 Background of the hospitality industry

The foodservices market within the hospitality industry forms the most significant portion the Southern part of South Africa, with large and highly competitive sectors (Petzer & Mackay, 2014). In South Africa, hospitality and tourism sectors are fast-growing, contributing towards the country's profit through a range of accommodation and collection of services to meet demands for various business and leisure purposes (Roberts *et al.*, 2013). The country's economy is boosted by increasing numbers of international and domestic travels affecting room price hikes benefiting foodservices market (Abidin *et al.* 2013). Recently South Africa has been impacted by global economic recession and has not been affected negatively. Statistics South Africa reported a total increase of approximately 13.8 percent through tourist accommodation in February 2016 compared15.4 percent increase in 2015 (Maduna & Ensor, 2015).

According to Petzer and Mackay (2014), South African food and beverage sector generated an increment in the income with a rise of 1.4 percent compared to sales in January 2016 and January 2015. Light snacks and drinks contributed positively towards 1.0 percent and 6.4 percent annual growth rates respectively (Maduna & Ensor, 2015). Analysis of sectors displayed annual profit rate for January 2016 contributed by eateries and coffee houses with 4.4 percent, and catering services at 2.4 percent income growth

(Maduna & Ensor, 2015). Foreign tourism is expected for future growth in the hotel industry due to major expansions.

The South African world-renowned wines and cuisine attracted millions of tourists to the country, increasing profit and the country's economy (Maduna & Ensor, 2015). The increase in profit is estimated at 8.3 % towards the country's Gross Domestic Product (GDP). Recent statistics and international tourism to South Africa have increased (Maduna & Ensor, 2015). In April 2016, South Africa hosted approximately 1.24 million foreign visitors, and the economy increased by 14.4 percent over the 1.09 million foreigners who visited the country compared to April 2015 (Maduna & Ensor, 2015). Most of the hospitality and tourism organisations are dominated by independent franchised foodservices (Purnomo, 2014). The sector is set to accommodate contract caterers tailoring products and services to meet high-end consumer demands. The sector is set up to accommodate quick stores in shopping malls, supermarkets, and airports as role players. The commercial sector has made a profit through hotels, fast food independents, restaurants, fast food chains, clubs, and national parks/resorts. Furthermore, franchise industry has noticeable growth contributed by a shift in food patterns as consumers prefer consumption to be away from home. The institutional /service sector includes health (public and private hospitals), educational institutions, and transport services.

Factors on outbreaks occurring in restaurants, take-away and fast-food places are resulted by lack of good hygiene practice, HACCP improper implementation, and cross-contamination and remains necessary legal requirements for implementation (Manning, 2018; Tegegne & Phyo, 2017). The adequate training of food handlers on good hygiene practices remains a key factor in increasing knowledge and awareness, ensuring restaurant-quality evaluations meet the legal requirements. Restaurant cleanliness and overall hygiene standard are not compromised (Casingena, 2016). Food preparation and services workers remain role players to block food-borne illnesses and are expected to preventative measures to prevent outbreaks (Arendt *et al*., 2013). Food handlers, middle managers of industries related to food and consumers are destined to possess enhanced knowledge on food-borne diseases originality, how food manufacturing and storage increase risks.

Adams (2018) reported systematic and continuous training sessions emphasizing on education as a necessity for food handlers and managers in hospitality and food processing industries as the best and most effective method to ensure protection. Once food safety parameters are clearly defined and understood, hazards and food risks remain minimized. A large number of handlers receive food safety training, but food poisoning outbreaks do not decrease due to poor food handling practices and improper food safety management systems utilised Strohbehn *et al*., (2013). Centre for Disease Control and Prevention presented an estimated 76 million customers contracting foodborne disease yearly on a global status, 1,500 million incidences of diarrhea occurring in children under the age of five and over 3 million deaths annually in the United States of America (CDC, 2014).

2.3. Food-borne disease

Microbial pathogens cause food-borne diseases. Microbial pathogens are microscopic living organisms that occur in the environment, with some classified as harmless while others are virulent and could cause infections (CDC, 2013). Food can become contaminated at any time and cause foodborne illnesses due poor basic standards in food hygienic practices. The primary vehicles recorded to transmit infections are directly or indirectly from food or water (Roberts *et al*., 2018). Food chain exist on events occurring between raw products, prior to harvesting, during slaughter or processing and contamination by food poisoning agents or as cross-contamination occurs at any stages in the kitchen or by food handlers. According to Ghezzi and Ayoun (2018) food-borne illnesses is caused by contaminated foods. Furthermore, foodborne are caused by pathogens or toxins (poisons). Similar, the CDC (2013) reported microorganisms such as bacteria, viruses, parasites and fungi and could contaminate food causing food-borne diseases.

There are five (5) risk factors related to human factors and food preparation methods contributing to the high prevalence of food-borne illnesses. The risk factors outline improper holding temperatures, inadequate cooking, contaminated equipment, food from unsafe sources, and poor personal hygiene (CDC, 2013). Food hygienically mishandled could be a transmission of hazards medium and contaminated food poses health threat

which is a challenge in developing countries causing difficulties in securing optimal hygienic food handling practices (Tegegne & Phyo, 2017). Hedberg (2013) reported food-borne diseases as a burden affecting the developing and developed countries, with aggravated socio-economic factors such as alarming rate of poverty, migration on a large-scale causing crowded cities to result in non-compliance to food safety practices.

In a comprehensive situation, the 2015 WHO report estimated 600 million illnesses, 420 000 mortalities, and 33 million premature mortalities globally resulting from food-borne diseases. Younger children aged five years and below, estimated to 125 000 (almost $^{1}/_{3)}$ of deaths caused by food-borne illnesses. The Centre for Disease Control and Prevention (CDC) estimated 9. 4 million food-borne illnesses, 71 878 hospitalisations, 1 686 deaths in the United Kingdom (Arendt, Paez & Strohlem, 2013). Mainly, World Health Organisation (2015) stated that annually in Africa, contaminated foods significantly contribute to foodborne diseases, with an estimate of 91 million hospitalisation and 137 000 deaths. The global representation is $^{1}/_{3}$ of mortality rate resulted from food-borne diseases.

About 79% of cases reported to the CDC occurred in sit-down establishments (Angelo *et.al*., 2016). In South Africa, food-borne diseases are notifiable due to underreporting. The outbreaks of 327 food-borne cases were registered with the National Institute for Communicable diseases between January 2013 to December 2017. The confirmed cases came from the three provinces KwaZulu-Natal contains 43.1%, Gauteng 19.3% and Mpumalanga 12.2%. The outcome resulted in illness with 11 155 patients, 8 680 hospital outpatients, 494 hospitalisation and 49 deaths (Centre for Enteric Diseases, 2017). In 2018, the South African Department of Health recorded 180 deaths of consumers from consuming Enterprise cold meat brand products containing listeria bacteria. The incident in South Africa forced the Department of Health to react and recall Enterprise food products for public safety (SADoH, 2018). Foodborne diseases outbreaks are a common occurrence and challenge affecting health matters for developing nations (Arendt *et al*., 2014; WHO, 2012). Food safety awareness remains a significant concern for all food

handlers affecting consumers' health (WHO, 2008). Consumers are end-users of food prepared in the hospitality industry and remain at risk.

A study conducted in Australia on food-borne outbreaks between the year 2001 and 2011 resulted in an estimated 3250 cases, 650 hospitalisation, and four deaths (Moffat *et al*., 2016). The statistical analysis reported 102 incidences associated with culinary entrepreneurship, including restaurants and fast-food premises. Statistics on South African food-borne diseases are not well-reported due to the lack of registrations (Faluke, 2015). However, Communicable Disease Communique recorded about 327 outbreaks of food-borne disease from January 2013 to December 2017, causing 11 155 people fell ill, 8 680 hospitalised, 494 as outpatients, and 49 deaths (Communicable Disease Communique, 2017). Majority of incidences were reported in KwaZulu-Natal at 43.1%, Gauteng 19.3% and Mpumalanga province 12.2%. In the year 2018, the South African Department of Health recalled the Enterprise food products and recorded 180 deaths resulted from consuming the brand cold meat products containing listeriosis (DoH, 2018). The reoccurrence of consumer food illness contributes to fewer clients making use of services and economic losses (Ghezzi & Ayoun, 2018).

2.4. South African food control authorities

South African food control is a shared responsibility between authorities responsible for ensuring food safety. The National Department of Health, administrators' food legislation and is responsible for coordinating activities such as food product recalls within the country, setting national norms and standards, supporting provinces and local authorities, and assuming the role of the National Codex Contact Point is administered on behalf of the Minister of Health by the National Department of Health (RSA Department of Health, 2004). Each province has a health services section responsible for food control at provincial level providing support strategies to local authorities within each province. Food control responsibility at the districts level depends on Environmental Health Services in their area of jurisdiction (RSA Department of Health, 2004).

Food safety is managed through HACCP systems, and the hazards are controlled from raw material production, handling, to manufacturing, distribution and consumption of

finished products (RSA Department of Health, 2010). HACCP program consist of seven-points to ensure food safety in the food industry. The program is utilised in the food industry and foodservice operations such as those in hospitals (Ansari *et al.*, 2013). In Italy, food-borne illnesses were reduced by foodservice settings through improved food handlers and foodborne diseases knowledge, attitudes, behavior, food safety training and hazard analysis critical control points (HACCP) system (Arisri *et al.*, 2013). Therefore, the Department of Health considers recommendations for HACCP programme to be implemented to prevent food-borne outbreaks (South African Department of Health, 2010).

The following are the legislative Acts governing food safety authority:

The legislation governing manufacture, sale, and importation of foodstuffs, cosmetics and disinfectants to ensure public health/ safety is managed under Foodstuffs Cosmetics and Disinfectants Act, 1972. Regulation, labeling and advertising of foodstuffs do not have provisions on hygiene to cater for handling and transportation. The Act also prevents individuals from selling unsafe food for human consumption and is contained in Section 2(1) Foodstuffs Cosmetics and Disinfectants Act, 1972 (South Africa,1972).

Regulations vary and are directed relevant to food safety enforced by local authorities in areas of jurisdiction. The legislation includes the Food Premises and the Transport of Food has regulations on hygiene, inspections and transportation of food outlined on Governing General Hygiene Requirements (G.N.No.R.1128 of 24 May 1991).

Regulations Regarding Food and Water Vessels (G.N.No.R.1575 of 10 September 1971), which aim to prevent the transmission of certain metals from containers to foodstuffs. General Regulations Promulgated in Terms of the Public Health Act, 1919 (G.N.No.R.180 of 10 February 1967), which refers to the transportation of meat and meat products. The Health Act, 1977 (South Africa, 1977), makes provision for Environmental Health Practitioners (EHPs) to detain, sample and seize any foodstuff in their areas of jurisdiction which is deemed harmful or injurious to human health. Food consumed at ports, airports, on vessels and aircrafts, as well as inspection of premises and the sampling of food by local authorities is guided and approved by the National Department of Health through

the International Health Regulations Act, 1974 (South Africa, 1974). The product quality standards for the local market and export purposes are controlled and managed by food safety quality standards in the Department of Agriculture through Agricultural Products Standards Act, 1990 (South Africa, 1990). Meat safety and hygiene standards in abattoirs and importation, exportation regulations of unprocessed meat are administered by the Food Safety and Quality Assurance and enforced by Provincial Department of Agriculture through the Meat Safety Act (South Africa, 2000). Consumers protection against consumption of potential hazardous food.

2.5. The management and food handler role in food safety management systems

The fundamental role of safety management is distributed among staff members and equates to “floors, walls and ceilings” culture (Purnomo, 2014). Management is in charge, and managers have a role in directing and leading employees to execute processes to enforce effective, safe food handling practices (Arendt *et al*., 2014). Managers are also key motivators to guarantee performance of an integral quality programme that extrapolate food safety management aspects (Casingena, 2016). Employees focus “in” the systems, whereas management works “on” the system. Manager’s roles and responsibilities within the system are to motivate and gain improvement. A properly working system promotes an integration of the company’s activities and a cohesive system that offers internal consistency. Food safety is key to every organisation, and is continuously developed and improved to apply safe food management systems (Arendt, *et al*., 2013). Traditional approaches such as endpoint testing, inspection, and knowledge-based training provide sufficient control on food safety hazards (Darko, Robertson & Wireko, 2015). Managers have a role in striving and ensuring accurate food safety approaches for the well-being of the business and serious consequences (Arendt *et al*., 2013).

The Catering service business aims to provide consumers with high-quality food and services and assurance that food will cause no harm as a priority (Arendt, 2013). Food safety procedures are to be led and guided by management and organizations are influenced by the formal or informal management systems. In the USA between year 1985 and 1999, law reviews reported. The requirement of evidence with a sworn

commitment by foodservice operator to guarantee entire food safety and reduced chances of food safety problems (Manning, 2018). The commitment could be interpreted documented policy, developed standards of operations, ongoing training programme targeting employees, regular inspections conducted by unit management, and detailed documentation for breakdowns experienced during transportation. Policies and procedures are to form active roles and be included in daily operations, and management and staff members are to adhere to avoid lawsuits. HACCP guidelines are followed in catering operations but are not enforcers of safety as some hazards and critical control points are impacted by factors such as personnel hygiene, hand washing, applying difficulty in measuring (Arendt *et al*., 2014). Catering managers are responsible for monitoring the quality of foodservice. The inability to manage contributes to far-reaching business consequences (Casingena, 2016). Consequences may be food-borne disease outbreaks, absence of management principles such as planning, organizing, and control food safety procedures (Arendt *et al*., 2014).

There are many factors influencing food handling practices. Strobehn *et al*., (2013) cited two studies in Oregon where barriers to correct food handling practices and proper hand washing was contributed to multiple factors such as time pressures, inadequate facilities, lack of accountability, and lack of manager and co-worker involvement. (Ghezzi & Ayoun, 2018).

2.6. Food safety training

Trainings on food safety and enforcement are tools utilised during foodservices to overcome safety challenges (Purnomo, 2014). Food safety training is fundamental to mold positive attitude and behaviour through learning experience in the workplace (Casingena, 2016). Food safety training translates knowledge to food handlers on proven actions guiding causes of food-borne illnesses and proper food handling behaviour (Darko, Robertson & Wireko, 2015). Enforcement is interlinked to workers' informed behaviour and aims to improve attitude and practices. The contextual organisational influences on worker behaviour change have been unnoticed (Baser *et al*., 2016). Food safety management can be achieved through effective food hygiene, and relevantly delivered to support an organisation with adequate resources and peer support (Matheus

et al., 2016). Food hygiene training is targeted to support food handler's positive intentions, actual behavior, and ensuring safety in working processes. The management's responsibility is to organise material and provide support in an organisation to ensure food safety.

Formal food hygiene training fulfils legal requirements within foodservice organisation, however associated with decreased number of outbreaks. Whereas the presence of a HACCP system is to guard against outbreaks (Webb & Marancie, 2014). Effective training depends on commitment, motivation, and management supervision. Food handler's attitude and hygiene practices were observed constant food with no improvements even after training (Angelo *et al*. 2016).

In South Africa, most foodservice businesses manage food safety without structured training policies to guide staff members but invest focus on obtaining certificates as evidence to fulfil the legal obligation by an organisation Matheus *et al.* (2016) Implementing change on the approach of certificates is necessary to prioritise competency on proper food handling practices, motivate food hygiene managers and introduce relevant food safety culture (Maning, 2018). The main effect on food hygiene standards with reinforced statements or incentives for compliance provides formal food hygiene training contributing towards food safety Abidin, Arendt and Strohbehn (2013).

One of the restaurant manager's responsibilities is to ensure that employees are trained in food hygiene. The management team is responsible to provide training resources to employees, either internal or external. All training interventions must specify learning outcomes to be achieved and management teams review the effectiveness of the training interventions towards changed and implemented new behaviours to benefit an organisation. Training program execution and effective implementation depend on trained knowledgeable, and positive-minded managers (Strohbehn *et al*., 2013).

In South Africa, training of foodservice employees is currently mandatory, as Regulation 10(b) spells out: "An employer with food premises is to ensure employees are trained on food hygiene by an inspector or any other suitable person" [Regulations Government

Notice No. R.918 of 30 July 1999, of the Health Act, 1977 (Act no. 63 of 1977)]. South African Health Department control section regulates management and health surveillance for handlers. The policy for service further ensures training of food handlers assuring appropriate programs are implemented.

The primary function of food control is to ensure food handlers are trained on continuous knowledge tested after training, and refresher courses provided. Currently, local authorities have unequal capacity to provide training, and the majority of companies search for other alternative training mechanisms for compliance to meet various legislative requirements. This regulation on training is a mechanism limited as a skeleton motivator and lacks evidence certification as training requirements of training. Nonetheless, other foodservice outlets have implemented food safety hygiene training for their employees (Arendt *et al.*, 2013).

Training aims to improve food safety levels by improving knowledge as considered flawed by researchers, and several studies have confirmed that it may widen knowledge to implement correct food safety practices. However, staff might be resistant to change based on food handling behaviour (Angelo *et.al.,* 2016). Strohbehn *et al*., (2013) asserted that although food handlers had food safety awareness, the results reported 63 % of food handler's non- compliance with food safety.

2.7. Food-borne diseases outbreaks

According to the World Health Organisation (2008), food-borne illnesses are "infectious and toxic when ingested through contaminated food". Moreover, food-borne outbreaks are known to be "cases linked to infectious products, usually affecting a vast majority of the population. Mohahydin *et al*. (2017) perceive food-borne illness as a burden with cost implications because consumers may end up paying for medication to treat the illness resulting from consumed infectious food. Outlines. The statistics of food-borne illnesses is reported by Matheus (2016) to be a total of 17, 640 cases between the years 1990 and 2008 in Italy, Mexico and Asia. The Asian food outbreaks are reported to be associated with *bacillus aureus, salmonella, staphylococcus* and *plasmin* as *shigellosis,* which was

caused by poor personal hygiene and lack of handwashing in food preparation (CDC, 2014). The restaurant areas are reported to be the most place (80%) associated with food-borne illness in Asian, followed by hotels (8%) and 16% for home-cooked meals as well as 7% for conferences (Matheus *et al*., 2016; WHO, 2015).

Angelo *et al*, (2016) reported that about 9788 restaurant outbreaks occurred in the United State of America. These reported outbreaks resulted from poor food handling practices. The results further reveal that 12608 incidences resulted in illnesses, about 4427 cases were hospitalised, and 32 died (Angelo *et al*., 2016). African regions experienced 91 million people becoming ill while, 137000 die every year due to food-borne illnesses (WHO, 2017). About 180 consumers died in South Africa due to Enterprise brand meat products consumed containing *listeriotic* bacteria (Fensurbush, 2018). The source of bacteria was processed meats (Viennas and cold meats). According Burke, Young and Papadolous, (2016) food-borne outbreaks in South Africa are common but remain unreported to relevant health authorities. Moreover, lack of reports increases risks and limits outbreaks from developing further.

2.8. Food safety knowledge and Food Handling Practices

Worldwide safety is a public concern for government and policy makers due to escalated numbers getting ill (WHO, 2014). Food composition depends on microbial contact with certain organisms gaining access and how they grow, survive and produce sterile food products (Kapaya *et al*., 2017).

An assessment completed by Turkey university students in cookery programs on food safety, hygiene knowledge and practice indicated that food safety and personal hygiene are important. Even though were without adequate knowledge Baser *et al.* (2016), trained workers with over 15-year experience in British Columbia and Canada scored low knowledge though certified (McIntyre *et al*. 2013). This shows that continuous training is crucial for ensuring safety and improved hygiene knowledge.

Food handlers were observed to have gaps in microbiological risks, cross-contamination and temperature control pointing out retraining needs Ansari *et al*. (2013). On-going training on food hygiene and food safety and assistance on improving handler's

knowledge and maintenance of high levels on hygiene standards across foodservice units. A review on the Mauritian Framework recommended a mandatory refresher training course (Gaungoo & Jeewen, 2013).

Globally, safety issues of safety in food are an accelerating concern affecting billions of clients suffering from illnesses caused by contaminated food. The health problem widespread, and can reduce economic productivity (Ansari *et al.,* 2013). Food safety also remains a growing health concern in both established and expanding nations creating an increase on foreign food trade and cross-boundaries movements of living organisms. Worldwide governments bodies work on intensifying and updating national food regulatory systems. Food safety management systems are enforced to ensure consumers protection. The hospitality sector approach to food safety management systems in the European Union is mandated and based on a hazard analysis critical control point (HACCP (Ansari *et al*., 2013). Food safety has become a growing concern for several sectors, inclusive of hospitality, food processing industry, government institutes, and public health agencies.

2.9. Food safety awareness

The Employment Conditions Commission Report (2016) describes hospitality as “any commercial business which employers and employees provide accommodation in hotels, motels, resorts, game lodges, hotels, guest houses, bed and breakfast, self-catering apartments, caravan sites, restaurants, pubs, taverns, coffee shops, fast food outlets, and caterers prepare food for guests”. Good food hygiene ensures food prepared by food handlers for consumers is safe to eat to prevent harmful microorganisms which can cause illnesses (Ansari *et al*., 2013).

Matheus *et al*.,2014, stated that providing awareness is necessary towards ensuring personal hygiene, specifically handwashing which may improve food hygiene. Handwashing is necessary before and during food preparation processes to preclude cross-contamination. Furthermore, assurance of excluding human saliva by food handlers is important to prevent contamination (Purnomo, 2014). Bartenders and chefs in restaurants can assist in minimising the risks of food-borne diseases. Crucial means are to be applied for increased safety awareness among food handlers by providing food

safety education and running campaigns. Baser *et al.* (2016) found food handlers in Turkey to possess knowledge on food safety. However, their research did not demonstrate that training in food safety practices, certifications and provision of education to employees, especially in the hotel sector automatically translated to change in attitude and behaviour.

However, Darko *et al*.'s, (2015) study found hygiene as a critical element for hotels to ensure quality meal production during food preparation. Furthermore, knowledge of safety is perceived as contributing factor ensuring food safety hygiene. Moreover, Ghanaian hotels consider handler's level of education to have an impact on preventing food poisoning hence, preventing the occurrences of food-borne illnesses as information imparted through tertiary education and training. Training assists in providing consumer trust in hotels, and consumers feel protected through proper hygiene practices.

Webb and Marancie (2014) and Darko *et al*. (2015) argued that safety knowledge amongst foodservice workers is the key element to protect against food-borne illnesses. Regular workshops and training sessions are recommended by health authorities to reduce contamination and ensure that correct food preparation procedures are taken into consideration. Moreover, food handlers are to be inducted on food safety policies and food safety management systems. Mohahydin ***et al's.*** (2017) study identified the relationship between food quality and food safety as these factors assist consumers to make decisions during the food purchase experience, especially in restaurants. Moreover, consumers are prepared to pay a fortune in exchange to quality. Therefore, hospitality role players have a responsibility to work hard to ensure that good quality food is provided.

2.10. Food safety management measures

Many programs, procedures, and measures to prevent food-borne illness control risks and hazards throughout the food flow is defined and is in place as food management systems (Engelo *et al.*, 2016). Food operations have pre preparations laid out before HACCP implementations, which includes food storage, product specifications, staff training, hygienically designed facilities, have good hygiene practices (GHP) engagements, pre-requisite programmes (PRP), cleaning and disinfectant regimes

Casingena, 2016). Both large and small-sized organisation are likely to implement HACCP systems in absentia of other systems such as hygiene (Adams, 2018). The PRP is the responsibility of manufactures in food industry and is well-developed to be implemented over many years (Strohbehn *et al*., 2013). However, Arendt *et al*. (2013) pointed failures, within the majority of pre-requisite programmes leading to food safety shortfalls. A large portion of recent food-borne illness outbreaks to hygiene deficiencies including environmental controls, employee hygiene, equipment design, cross-contamination and water quality (Mohaydin *et al*., 2017). Hygiene regimes must be controlled in parallel oto verall quality assurance system necessary prior to HACCP system implementation. Management responsibility remains on the provision of correct resources to implement effective PRP.

The HACCP system is a proactive preventive food safety control method to related problems. Food safety is guaranteed in many food sectors through food safety management systems (Ansari *et. al*., 2013). Internationally, HACCP system is utilized for food safety management and control. Codex Alimentarius Commission of the Food and Agricultural Organisation (FAO) and the World Health Organisation contain standards of reference for the implementation of HACCP (WHO) (CAC RCP, 2004). The standard reference identifies seven principles that articulate 12 stages for implementation. HACCP aims to control significant food safety hazards, i.e., hazards likely to cause an adverse health effect when products are consumed (Manning & Soon, 2016). However, implementation of support systems of pre-requisite programmes is a necessary. The prerequisite programmes were called “the universal steps or procedures that control the operational conditions within a food establishment allowing for environmental conditions favourable for the production of safe food”. These programmes further simplify HACCP plan and ensures appropriate focus on significant hazards (Ansari *et al*., 2013).

HACCP systems have documented challenges related to the use in foodservices, the need for food safety management cannot be disputed (Manning & Soon, 2016). Food safety management systems provide active managerial controls for food safety risks and pays more attention to five most prevalent risk factors contributing towards food-borne illnesses as identified by the Centre for Disease Control and Prevention. The risk factors

include unsafe food sources purchases, inadequate cooking of food, improper food holding temperatures, contaminated equipment, and general poor personal hygiene practices (Arendt *et al*., 2013).

Management interventions are necessary to ensure an effective food safety management system aiming for successful catering operations within an organisation to produce high quality food which is the main goal in food safety (Mohaydin *et al*., 2017). Food supply is dependent on management intervention, and all companies are observed to have formal or informal food safety management systems in place. The management system form associations with quality management systems specifically focused on food safety.

HACCP systems in foodservice have challenges identified as flexibility in accommodating revamped products or procedures, diverse employee capabilities and inconsistent production volumes. Challenges discovered in the catering services included possession of minimal knowledge and training, staff turnover and large numbers of workers employed as casuals (Arendt *et al.,* 2014). Furthermore, organisational culture should be easily practiced (Ansari *et al.,* 2013).

Worldwide, every country uses different systems to address food safety. The systems may incorporate HACCP that warrants quality service and product delivery in the whole food flow, and the International Organisation for Standardisation (ISO), the world's largest developer of voluntary international standards. The most relevant standard to this study was ISO 22000, related to Food Safety Management Standard. Although HACCP had been presented as one of the paramount food safety measures, the system was viewed by industry as costly and hard to implement because of lack of capacity and lengthy processes, which many institutions felt was tiresome and beyond their financial capacity (Ansari *et al*., 2013). The positive outcomes for HACCP or food safety management systems depend on the organisational culture. People who implement and operate reflect neither technical expertise, attitude and approach to food safety management (Casingena, 2016). These skills depend on the management structure within an organisation. Arendt *et al.* (2014) registered motivation, evaluation, leadership, and training as crucial management skills missing in small businesses, and the lack of these skills can impact the effectiveness of a food safety management system.

3. CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter presents the research methodology that is applied to realise the aim and objectives of this study. This chapter discusses the study design and research method that is used in this study. Furthermore, this chapter includes the population, study sample, and sampling methods, data collection and data analysis that were followed. The ethical considerations are also presented in this chapter. The respondents' gender, age, education level, formed part of the demographic information in this section which is one part of the questionnaire. This enabled the interpretation of findings in terms of subsets of the sample.

3.2. Research setting

The research was conducted the study was in uMhlathuze Municipality under UThungulu District municipality, in the Northern KwaZuluNatal, which is one of the nine provinces in South Africa. The KwaZulu-Natal is the second largest, after Gauteng in terms of the population in South Africa. The province contains an increased unemployment rate of approximately 23.9% as of the first quarter in the year 2016 and second quarter it was 25.8% (Statistics South Africa, 2017b). The population is estimated to 325 000 persons representing 7.6% of the KwaZulu-Natal population (Statistics South Africa, 2017a). The city of uMhlathuze is made up of the following regions: Richards Bay, Empangeni, eSikhaleni, Port Durnford, Vulindlela, Felixton, eNseleni and Ngwelezane, as well as the rural areas under Inkosi uDube, Inkosi uMkhwanazi, Inkosi uKhoza and Inkosi uZungu. uMhlathuze assumed city status on 21 August 2001. The name uMhlathuze is derived from the uMhlathuze River that meanders through the municipal area and unifies these towns, suburbs and traditional areas symbolically.

The city of uMhlathuze is rich in diversity and is the ideal holiday destination where nature lovers can explore the internationally acclaimed game reserves and visit the spectacular wetlands. Outdoor and sporting enthusiasts can take advantage of the subtropical climate and endless beaches and cultural heritage seekers can visit Zulu Cultural Villages, museums and markets.

3.3. Research Design

The study is quantitative in nature. Quantitative quantifies problems and implement ways of transforming it into usable statistics (Maree, 2016). It is used to quantify knowledge and awareness on food handlers, managers, and consumers and other defined variables generalising from a larger sample population. The type of study was cross-sectional limited and is carried out over a short period regarding knowledge and awareness on food safety. The data in the study were collected at once and the entire population or a subset thereof was severely elected from the participants and have been extrapolated to the entire food handlers, managers, and consumers in foodservice operations of the uMhlathuze Municipality, KwaZulu-Natal to collect data to help answer research questions study (Maree, 2016).

3.4. Study population

A total of 381 hospitality industry facilities food handlers, managers and consumers participated in the study, who were involved in the preparation and serving of food based on their availability at their establishments workstations. A cross sectional survey was conducted on ten (10) various hospitality industry facilities in the uMhlathuze Municipality, KwaZulu-Natal, South Africa. The uMhlathuze Municipality is one of the 52 municipalities determined in terms of Local Government, Municipal Demarcations Act, No 27 of 1999 (MDA).

The table below represents study population on different hospitality service facilities:

Hospitality service facility	Study population		
	Managers	Food Handlers	Consumers
(3) Hotels	20	25	30
(1) Bed and Breakfasts	20	25	30

(2) Guesthouses	20	15	30
(2) Fine-dining restaurants	20	20	30
(1) Lodges	11	15	25
(1) Catering services	10	10	25
Totals	101	110	170

3.5. Sampling of respondents (sampling procedure)

The hospitality service facilities in the study were purposefully selected and a stratified sampling method was used for participant's simplification. The eligible hospitality service facilities were sampled using simple cluster sampling; hospitality service facilities were stratified according to the regions of the municipality and randomly selected from each region.

The sample of respondents was drawn from the population of Umhlathuze municipality. Purposive sampling was used to select hospitality establishments sample for suitable respondents, because the sample is composed of elements containing most characteristic representative or typical attributes of the population to serve the purpose of the study best (Grinnell & Unrau, 2008). A targeted population for this research included managers, food handlers and consumers within 10 various hospitality establishments randomly selected. In addition, randomly stratified sample of 381 respondents was used for collecting relevant information sampling occurred from each sampling unit clearly defining population presenting an equal chance of being included as sample (Maree, 2016). The method obtained drawing two respondents from food handlers, consumers and managers as all formed part of the research study population. Respondents were consumers of ready-to-eat food who were above the age of 18 years and food handlers employed in hotels, fine dining restaurants, Bed and Breakfast, Guesthouses, Lodges and catering services in uMhlathuze municipality.

3.6. Data collection Techniques

Data were collected using pre-validated self-administered questionnaires. The food safety knowledge questionnaire was formulated to gather levels of understanding of food safety handling and awareness on food-borne disease, hygiene, food safety practices, cross-contamination, training, cleaning, and temperature control. The questionnaires were used as the main tool for collecting data from food handlers, consumers and managers/supervisors of the hospitality operations (Appendix A). The questionnaire comprised demographic data section, personal hygiene, time and temperature control, food safety attitude, food safety awareness, and management commitment to food safety.

The questionnaires consisted of questions to collect data on participants' opinions based on food safety aspects and the administrative support to food safety. The questionnaires format accommodated various close-ended, and multiple-choice responses with three /four or five-point scale such as agree, disagree and not sure for participants and a few open questions clearly described before participant's responses. Biased responses were reduced through the multiple-choice responses including ''not sure'' option leading respondents. The instrument consisted of parts including demographic information for hospitality employees (such as education level, age, gender, number of years' staff in foodservice operations, food safety training). Food hygiene and safety guidelines, textbooks and training materials were used to validate answers as "correct" or "incorrect".

3.7. Data collection from respondents

The selected hospitality establishments were visited during the day when normal operations were in progress. Prior to data collection, the permission to conduct the study was obtained from management. The consent of food handlers, managers and consumers was obtained prior to administration of the questionnaires. Data collection was gathered using a combination of pre-validated questionnaires and face to face interviews were used in obtaining data from respondents who agreed to participate. The data was collected by the researcher and trained research assistants (field workers) for about 12 months, between May 2020 until June 2021. The questionnaires were given to the

manager for other managers, food handlers and consumers making use of each facility for self-administering the questionnaire to complete during permitted allocated times given by management of each establishment. Some participants preferred to be interviewed by the researcher using the same questionnaire. The completed questionnaires were checked for completeness by the researcher and research assistants (fieldworkers).

3.8. Data analysis

The questionnaire responses were edited and analysed. The output was created by running descriptive statistics, ANOVA analysis from the data received. The data were captured on an excel spreadsheet and were analysed quantitatively using the Statistical Package for Social Sciences (SPSS) for analysis. The data collected were analsed and interpreted to make meaning of the findings. Frequency-percentage tables, tables, graphs and cross-tabulations were used to analyse the information. The chi-square tests were also performed to analyse significant association between categorical variables and odd rations calculated. Statistical significance was set at p-value 0.05, indicated significant association between variables. A statistician was consulted for guidance and assistance.

3.9. Pilot test

Pilot work was conducted as a preliminary investigation. The pilot was conducted to ten hospitality handlers randomly selected for the pilot study. The ten pilot tests responses were excluded from final data analysis. The primary purpose of this pilot test was to check whether questions solicited in the questionnaire acquired the expected responses and also to reveal consistency in terms of meaning and expression attached to them. In other words, pilot test was conducted to the reliability and validity of questions. All ten respondents completed the questionnaires and took approximately 10-15 minutes to complete. Evaluation to ascertain whether objectives of the study were covered was drawn from the pilot test and clues to increase the chances of obtaining unambiguous response.

3.9.1. Establishment of Validity of the questionnaire

Validity is a way of assessing the quality of measurement procedure used to collect data in a dissertation (Maree, 2016). In this study, validity was achieved through examining content validity by a panel of experts with experience in food safety. This ensured that the instruments were valid for anticipated purpose and the contents were suitable for measuring what they were supposed to measure under same conditions (Maree, 2016).

3.9.2. Factor analysis and reliability of the questionnaire

Evaluation of quality on data collection instruments for the research were verified to ensure reliability. The reliability of the questionnaire was verified by conducting a pilot study among 10 food handlers who were randomly selected at Umhlathuze Municipality in the foodservice establishments which had the same characteristics as the sample population in the study. Questions which were unclear to the participants were evaluated for food clarity, content and length. The questions were modified and pilot study participants were not part of the final sample. Feedback from the pilot test was used to make revisions to the questionnaires. Thereafter, necessary adjustments were made to ensure stable and consistent results.

3.10. Ethical issues

The proposal was submitted to the Ethics Committee of the College of Agriculture and Environmental Sciences, University of South Africa. Ethical clearance (2017/CAES/000) was granted in order to ensure that the study compiled with the rules of ethics prescribed by the Medical Research Council of South Africa Regulations 1993. A formal letter describing the purpose of the study was sent to various hotels, and restaurant establishments in uMhlathuze Municipality, KwaZulu Nata. Permission l was obtained from management on a variety of hospitality establishments where research was to be conducted. An informed consent letter was completed for approval from management to conduct research was submitted. Each participant who agreed to take part in the study was presented with a research information form, which explained nature and purpose of the study in details before collecting data. A standard consent form was completed by

each participant who agreed to take part in the study. Participants identification remained anonymous and confidentiality was maintained with the purpose of the survey, participant's roles in the study and their right to withdraw at any time. Objectives and aim of the study were disclosed and detailed explanation about the study was given to participants and required to sign as an acknowledgement prior to their participation in the study.

4. CHAPTER 4: RESULTS

4.1. Introduction

The main purpose of this chapter is to present and interpret the findings of this research. A total of one hundred and ten (110) food handlers, one hundred and one (101), and one hundred and seventy consumers (170) participated in this study. The researcher required respondent's personal information which included age, gender, years of experience, level of education and work activity and they were required to respond to questions relating to food safety attitude, knowledge and awareness.

4.2. Demographic information

The table below (Table 4.1) shows the gender, age, years of experience, education level and work activity. A total of 110 food handlers participated in this study, with the majority (70%) being females and 30% being males of ages between the age of 25-35 years. Most respondents (47%) were undergraduates with skills certificates as a qualification out of which 32% had vocational certificates and 7% with a university Diploma and 6% with a university Degree. The majority of staff members (54%) had less than 5 years' working experience in foodservice unit. Twenty-four percent (24%) had 5-10 years' experience and 9% had 10-15 years and 4% above 25 years of working experience. The majority of respondents (63%) had previous experience in the industry before the current position, and 37% did not have any industry experience. This study indicates that the majority of respondents (82%) were employed as food handlers or cooks, 7%, as other which could be interns or trainees, 5% as foodservice supervisors and 3% as both cleaners and scullery, employed in the food preparation area. Furthermore, the majority (70%) respondents had attended food safety training and obtained certificates, and 30% did not receive training and had no certificates. The respondents had different levels of education, years of experience, and different work activities. The majority (70%) of respondents indicated they were utilising the HACCP program. The monitoring system, and 30% did not use HACCP program. The majority (70%) had designated safety assurance official onsite,14% indicated that the designated safety assurance denied the

official onsite, and 16% were unaware about the official. Almost all respondents 88% indicated to having cleaning tools, equipment and 12% did not have equipment and tools for cleaning.

Table 4.1:Demographic characteristics of food handlers (N=110)

Demographic characteristics		Frequency (n)	Percentage (%)
Q1.1 Gender	1 Male	33	30
	2 Female	77	70
Q1.2 What is your age?	1 Under 25 years	39	36
	2 25-35 years	52	47
	3 36-45 years	8	7
	4 46-55 years	11	10
	5 56-65 years	0	0
	6 Over 65 years of age	0	0
Q1.3 Which of the following best describes your level of qualification?	1 Less than high school	9	8
	2 Vocational certificates	34	32
	3 Skills certificate	52	47
	4 University of Technology Diploma	8	7
	5 University degree	7	6
	6 Postgraduate degree	0	0
Q1.4 Years of experience in Foodservice Unit	1 Less than 5 years	59	54
	2 5 – 10 years	27	24
	3 10 – 15 years	10	9
	4 15 - 20 years	10	9
	5 20 – 25 years	0	0
	6 Above 25 years	4	4
Q1.5 Do you have previous experience in foodservice before your current position?	1 Yes	69	63
	2 No	41	37
Q1.6 Which one below represents your work activity?	1 Food handler/ Cook	90	82
	2 Scullery	3	3
	3 Cleaner	3	3

	4 Supervisor	6	5
	5 Other (specify)	8	7
Q1.7 Have you attended any food safety training course in which you were offered a certificate?	1 Yes	72	70
	2 No	36	30
Q1.8 Are you currently utilising a HACCP program/monitoring system in your foodservice unit?	1 Yes	75	70
	2 No	35	30
Q1.9 Does your facility have a designated food safety assurance person?	1 Yes	77	70
	2 No	18	16
	3 Don't know	15	14
Q10 Are there enough cleaning tools to clean the kitchen e.g. broom, mop, cloths, sponge, etc?	1 Yes	88	88
	2 No	12	12

Consumers who participated in this study comprise of 111 females and 59 males as respondents. The data in Table 4.2 represents demographic information of participants. Data are represented with the frequency of the number for each demographic field column is represented through (n) and the percentage it represents as the total number of respondents in this study indicated on the far-right column. The data are therefore based on a total of 170 respondents who completed all sections of the questionnaire. According to the demographic characteristics of respondents in Table 4.2, the majority of respondents were females (65%), compared to 35% males. The majority of respondents (45%) were under 25 years of age, followed by those between 25 and 35 years (37%). Most of the respondents (26%) have attained a university of technology diploma as the highest level of education, while only a few (8%) have attained a postgraduate degree, the rest of the respondents (25%) attained vocational certificates, and skills certificate and a low number (11%) attained a university degree as the highest qualification (Table 4.2).

Table 4.2: Demographic characteristics of consumers (N=170)

Demographic characteristics		Frequency (n)	Percentage (%)
Q1.1 Gender	1 Male	59	35
	2 Female	111	65
Q1.2 What is your age?	1 Under 25 years	76	45
	2 25-35 years	63	37
	3 36-45 years	23	13
	4 46-55 years	5	3
	5 56-65 years	3	2
	6 Over 65 years of age	0	0
Q1.3 Which of the following best describes your level of qualification?	1 Less than high school	9	5
	2 Vocational certificates	43	25
	3 Skills certificate	41	25
	4 University of Technology Diploma	45	26
	5 University degree	18	11
	6 Postgraduate degree	14	8

Table 4.3 indicates that a total number of 101 managers who participated in the study. The majority of respondents were females (51%) and about 37% of respondents were between the ages 36 and 45 years of age. The majority (44%) had a University of Technology Diploma as the highest level of education, only 20% with skills certificate and the minority (8%) with a post-graduate degree.

Table 4.3: Demographic characteristics of managers (N=101)

Demographic characteristics		Frequency (n)	Percentages (%)
Q1.1 Gender	1 Male	49	49
	2 Female	52	51
Q1.2 What is your age?	1 Under 25 years	4	4
	2 25-35 years	26	26
	3 36-45 years	38	37
	4 46-55 years	28	28
	5 56-65 years	5	5
	6 Over 65 years of age	0	0
Q1.3 Which of the following best describes your level of qualification?	1 Less than high school	3	3
	2 Vocational certificates	16	16
	3 Skills certificate	20	20
	4 University of Technology Diploma	45	44
	5 University degree	9	9
	6 Postgraduate degree	8	8

4.3. Personal hygiene

The data in Table 4.4. shows that 38% on food handlers had higher knowledge on personal hygiene, followed by 36% of food handlers with moderate knowledge on personal hygiene and 26% had lower personal hygiene knowledge.

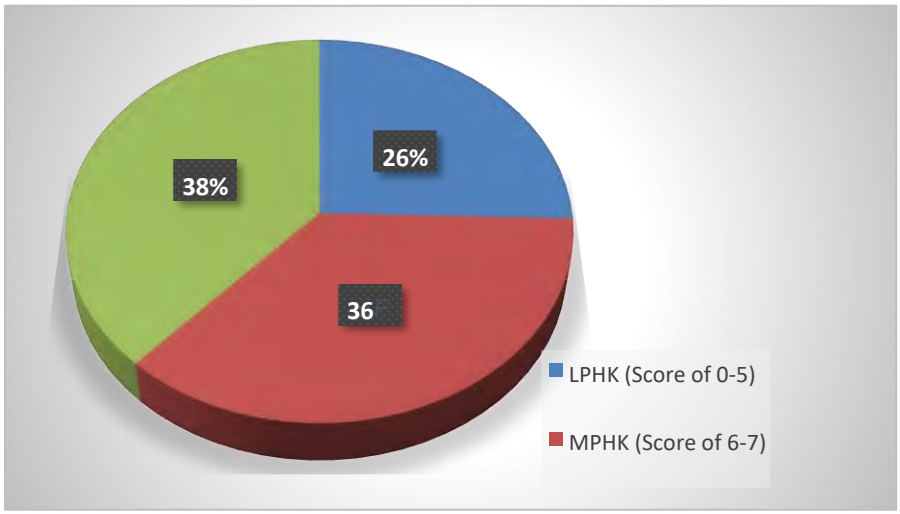

Figure 4 1:An assessment of personal hygiene knowledge (total score: 10)

LPHK = lower personal hygiene knowledge; MPHK = Medium personal hygiene knowledge; HPHK = Higher personal hygiene Knowledge

The data in Table 4.4, shows that when food handlers were asked about avoiding contamination of food by clothing; the majority (85%) were aware that the risk of food contamination can be prevented by storing clothes in a locker or storeroom. It is known that when food handlers are sick with flu or diarrhea may pose a risk of contaminating the food. The response of food handlers (64%) demonstrated awareness of not handling food until they are medically cleared.

Generally, handwashing is important and is performed frequently by food handlers. Most respondents, (43%), indicated 43% of handwashing is done using a detergent, and 14% indicated that pine gel was used for handwashing. However, almost all respondents (90%) indicated knowledge to refrain from work when developing food-borne symptoms.

Minor accidents do take place in the workplace, and in case of hand-cut as a minor injury, almost all respondents (89%) responded that a bandage and non-latex gloves are to be used as an aid to stop bleeding

The majority of respondents 59% used the handwashing sequence beginning with wetting hands, application of soap, scrubbing, rinsing and air drying which contradict washing, rinsing, towel drying and sanitizing at a minimum of 11%. It is represented as a good practice in food handling to wash hands then dry with a paper towel with a majority of respondents 62% were able to provide a correct response as opposed to air drying at 34% and 2% for both shaking water from hands away and the use of cotton wool. Moreover, hand drying is important to prevent water dripping and prevention of the spread of germs indicated by 53% as the majority of the respondents. Furthermore, the majority of respondents (76%) understood the importance of not wearing jewellery during food preparation whilst a minority of 3% of the respondents indicated a bracelet as an acceptable piece of jewellery while on duty.

Table 4.4: Personal hygiene (N=110)

Knowledge questions on personal hygiene	**Frequency (n)**	**Percentage (%)**
2.1 In order for your clothing not to contaminate food, you need to……		
1 Store personal belongings and clothing in food storage areas at the corner.	5	5
2 Change in the toilet.	3	3
3 Store personal belongings and clothing in a locker or changing room.	**94**	**85**
4 All of the above	8	7
2.2 If a food handler is sick of flu or diarrhoea, he/she should……		
1 Wash hands before work.	6	5
2 Take medicine before going to work.	7	6
3 Take adequate rest at home.	28	25
4 Not handle food until he receives medical clearance	**69**	**64**
2.3 To wash the hands we can use…		
1 Bleach	0	0
2 Detergent	47	43
3 Pine gel	16	14
4 None of the above	47	43
2.4 Which of the following symptoms make the food handler refrains from workplace?		

1 Vomiting	7	6
2 Fever	1	1
3 Diarrhoea	3	3
4 All of the above	**99**	**90**
2.5 If you have a cut on your hand, you must…….		
1 Stay at home	3	3
2 Continue working and hope that bleeding stops	0	0
3 Stop the bleeding, cover it with bandage and wear non-latex gloves	**98**	**89**
4 Keep your hand elevated to stop bleeding	9	8
2.6 Hand washing should be done……		
1 Before handling food during food preparation	16	15
2 After handling food during food preparation	2	2
3 In between the handling of food during food preparations	2	2
4 All of the above	90	81
2.7 Which one step do you follow for washing hands?		
1 Rinse, wash, sanitize and air dry	12	11
2 Sanitise, wash, rinse, pre-scrape and towel dry	9	8
3 Wash, rinse, towel dry and sanitise	24	22
4 Wet hands, apply soap, scrub, rinse and air dry or paper towel	65	59
2.8 For drying hands after washing, one must……		
1 Use a cotton wool	2	2
2 Just shake excess water away	2	2
3 Use an air dryer	38	34
4 Use a paper towel	**68**	**62**
2.9 Hands must be dried after washing in order to……		
1 Prevent dripping of water	4	4
2 Prevent germs and bacteria which get spread with wet hands	44	40
3 Hold the utensils properly	3	3
4 1 and 2	**59**	**53**
2.10 Which of the following jewellery is acceptable for you to wear in the food preparation area?		
1 Watch	2	2
2 Arm ring	21	19
3 Bracelet	3	3
4 None of the above	**84**	**76**

4.4. Knowledge of microbial hazards and food-borne diseases

The data on Figure 4.2 shows that 45% of food handlers had moderate knowledge on Microbial Hazard and Food-borne Diseases followed by 30% food handlers had higher knowledge on Microbial Hazard and Food-borne Diseases with 25% of food handlers who had higher Microbial Hazard and Food-borne**.**

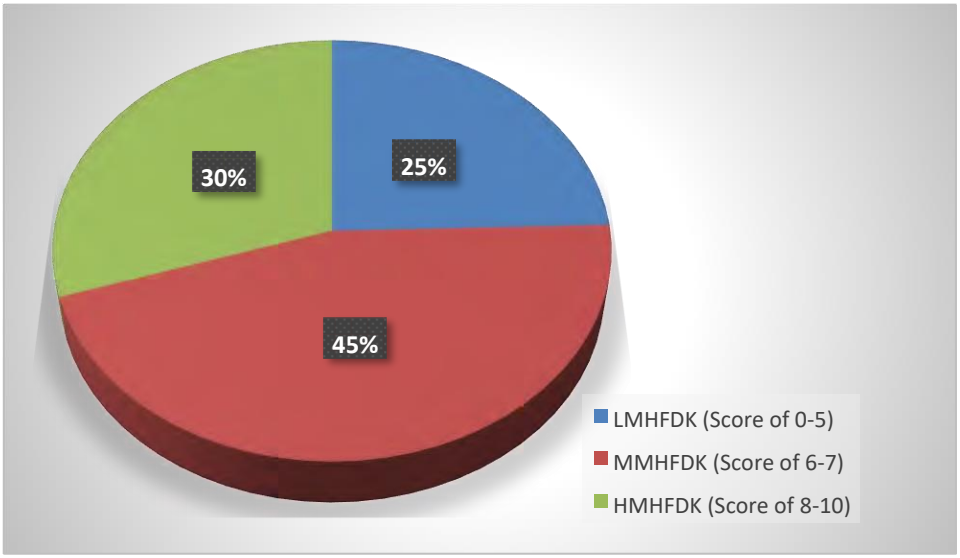

Figure 4 2: An assessment of temperature control for food safety knowledge (total score: 10)

LMHFDK = lower Microbial Hazard and Food-borne Diseases Knowledge; MMHFDK = Moderate Microbial Hazard and Food-borne Diseases Knowledge; HMHFDK = higher Microbial Hazard and Food-borne Diseases Knowledge

The majority of respondents knew signs and symptoms of food poisoning as shown by the high percentage of their responses (Table 4.5). Additionally, the majority (73.6%) correctly indicated that the occurrence of food poisoning is due to contaminated food. Furthermore, 62% of food handlers correctly indicated that bacteria grow faster in a warm environment. Seventy percent (70%) of respondents correctly indicated that food bacteria contamination can be prevented by ensuring proper food hygiene. Similarly, 59% of respondents indicated that continued hand washing prevents bacteria contamination.

Most (64%) respondents indicated prevention of microbial contamination is to be assured through hand washing with warm water and soap for at least 20 seconds and is to be done before, during, and after food handling. Regarding cross-contamination, the majority (50%) correctly indicated that cross-contamination is a potential risk when mixing cooked and raw foods on one chopping board. About 82% of respondents correctly indicated poultry products are mostly associated with Salmonella as the main food-borne pathogen.

Table 4.5: Knowledge on microbial hazard and food-borne diseases (N=110)

Knowledge questions on microbial hazard and food borne diseases	**Frequency (n)**	**Percentage (%)**
2.13 What are the signs and symptoms of food poisoning?		
1 Vomiting, Nausea	4	4
2 Stomachache	0	0
3 Diarrhoea	8	7
4 All of the above	**98**	**89**
2.14 Food-borne infections occur when people eat…….		
1 Poisons food	23	21
2 Spicy foods	4	3.6
3 Cold foods	2	1.8
4 Contaminated food	**81**	**73.6**
2.15 Which of the following is true about the bacteria?		
1 Bacteria multiply and grow faster in warm environments	**69**	**62**
2 Bacteria do not need air to survive	3	3
3 All types of bacteria lead to poisoning	12	11
4 Freezing prevents transmission and multiplication of bacteria	26	24
2.16 Which of the following is important to prevent bacteria contamination of food?		
1 Thoroughly wash and dry hands	17	15
2 Never cough or sneeze over food or where food is prepared or stored	11	10
3 Covering and tying hair.	5	5
4 All of the above	**77**	**70**
3.1 Risks for food contamination by microorganisms exist…….		
1 at each step in the flow of food	**65**	**59**
2 only during the preparation and service of food.	24	22
3 only with potentially hazardous food.	9	8
4 only when leftover foods are used.	12	11
3.7 If you suspect microbial contamination, hands should be washed by……..		
1 Rinsing under warm water with soap for at least 20 seconds	19	17
2 Washing with soap and cool water for at least 20 seconds	4	4
3 Washing under warm water for at least 20 seconds	16	15
4 Washing under warm water with soap for at least 20 seconds	**71**	**64**
3.9 The practice most likely to result in cross-contamination of food is……..		
1 Cleaning and sanitising cutting boards after cutting raw poultry.	34	30
2 Serving cooked chicken with a pair of tongs.	5	5
3 Breading raw chicken using clean disposable gloves.	16	15
4 Cutting raw chicken and shredding lettuce for a salad on the same cutting board.	**55**	**50**
4.18 Food-borne diseases in children due to *E. coli* contamination can cause kidney failure.		
1True	**86**	**78**
2 False	24	22
4.19 Uncooked chicken and raw eggs can carry *Salmonella* (a harmful germ).		

1 True	**89**	**82**
2 False	19	18
4.25 if you realised that your electricity has been off and the meat, chicken and fish in your freezer has thawed. What would be the best thing to do to prevent microbial growth?		
1 Throw them away	**16**	**15**
2 Cook them immediately	94	85
3 Smell or look before deciding what to do	0	0
4 Re-freeze immediately until solidly frozen, then cook it	0	0

4.5. Temperature control for food safety knowledge

Data in Figure 4.3, show that the majority (75%) of food handlers had low microbial hazard and food diseases knowledge, 2 % had high levels of microbial hazard and contrarily to 23% with moderate knowledge

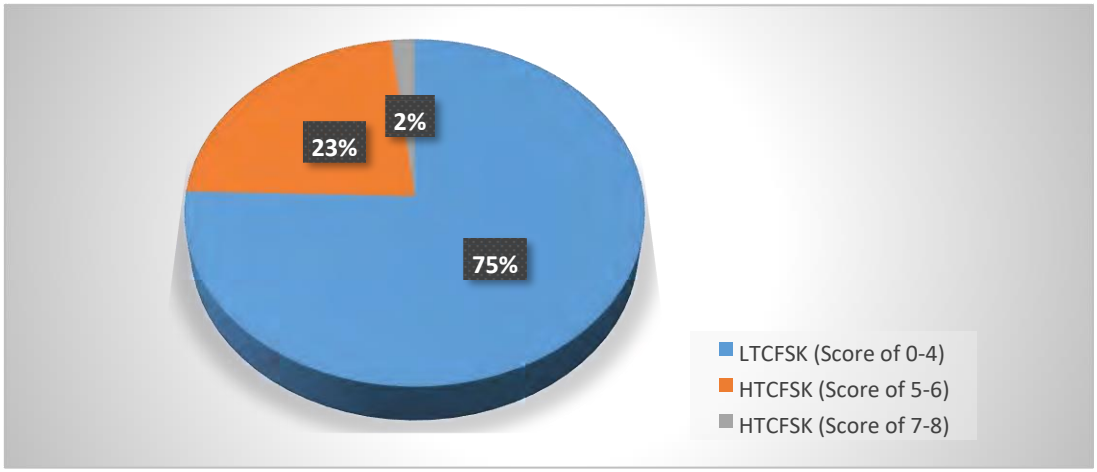

Figure 4 3: An assessment of overall food safety knowledge (total score: 8)

LTCFSK = lower temperature control for food safety Knowledge; HTCFSL = temperature control for food safety Knowledge

As indicated in Table 4.6, the majority (46%) showed knowledge of 5ºC and 60ºC as the correct danger zone temperatures for most food products. Fifty-three percent of the respondents correctly indicated the bottom shelve of the refrigerator as the correct area for thawing raw meat.

It was noticed that most respondents were not sure of the minimum internal cooking temperature of poultry, only 41% of the respondents correctly indicated 74ºC. Only 34%

of respondents correctly indicated 74ºC as the heat to be used to thaw reheated food. Thawing in the refrigerator is the best way to safely thaw frozen food. The majority of respondents (75%) displayed knowledge thereof. Regarding appropriate storage of prepared food for the duration of 2hours, 40% of food handlers agreed that food is to be placed in the kitchen counter until ready to eat. The majority of food handlers, (61%) displayed a lack of knowledge responding that the safest way to cool a large pot of hot soup requires cleaning a shallow pan to refrigerate it right away. A minority (28%) of food handlers responded correctly that the pot is to be cooled at room temperature and then be cooled. Furthermore, responding to the number of days appropriate to refrigerate hamburger patties, 46% responded as the majority with one or two days as an incorrect response. Thirty-six percent of respondents displayed to be knowledgeable when responding within 3-4 days.

Table 4.6: Temperature control for food safety knowledge (N=110)

Knowledge questions on temperature control for the safety of food	**Frequency(n)**	**Percentage (%)**
3.3 The temperature danger zone for most food items is……..		
1 32ºF and 180ºF (0º and 82ºC)	39	34
2 40°F – 140°F (4.5°C – 60°C)	5	5
3 41ºF and 135ºF (5ºC and 60ºC)	**48**	**46**
4 41ºF and 145ºF (5ºC and 63ºC)	18	15
3.4 Raw meat that is thawing should be stored…….		
1 on the top shelf of the refrigerator.	21	19
2 on the middle shelf of the refrigerator.	13	12
3 on the bottom shelf of the refrigerator.	**58**	**53**
4 Any shelf in the refrigerator is acceptable.	18	16
3.5 Poultry is safe to serve if the internal temperature is…….		
1 140ºF (60°C)	24	22
2 155ºF (68°C)	8	7
3 165ºF (74ºC)	**45**	**41**
4 180ºF (82ºC)	33	30
3.6 Previously cooked foods must be thoroughly reheated to……		
1 140ºF (60°C)	16	15
2 155ºF(68°C)	22	20
3 165ºF (74ºC)	**38**	**34**
4 180ºF (82ºC)	34	31
4.9 The safest way you use to thaw (defrost) food is to…….		
1 Keep container at room temperature	5	5
2 Sink with hot running water	5	5

3 Sink at room temperature over night	16	15
4 Keep in the refrigerator	**84**	**75**
4.26 What is the proper way of storing a cook meal for 2 hours?		
1 Store it in the refrigerator and reheat it when the child is ready to eat it	**39**	**36**
2 Place it on the kitchen counter until the child is ready to eat it	44	40
3 Store it in a cool oven until the child is ready to eat it	18	16
4 Store it in a warm oven until the child is ready to eat it	9	8
4.27 The safest way to cool a large pot of hot soup is…….		
1 Put the soup in a clean shallow pan and refrigerate immediately	66	61
2 Keep the soup in the cooking pot and refrigerate immediately	6	5
3 Put the soup in a clean, deep pot before and refrigerate immediately	7	6
4 Cool the soup to room temperature on the counter, then refrigerate it	**31**	**28**
4.29 What is the duration to store beef hamburger patties in the refrigerator?		
1 1-2 days	50	46
2 3-4 days	**40**	**36**
3 5-7 days	8	7
4 More than a week	12	11

4.6. Food safety knowledge and awareness of food handlers

Figure 4.4 shows the information on the overall food safety knowledge and awareness. Based on Figure 4.4, more than half (66%) of food handlers had moderate knowledge on food safety and awareness, 9% had high levels of knowledge and awareness, and 25% had poor knowledge.

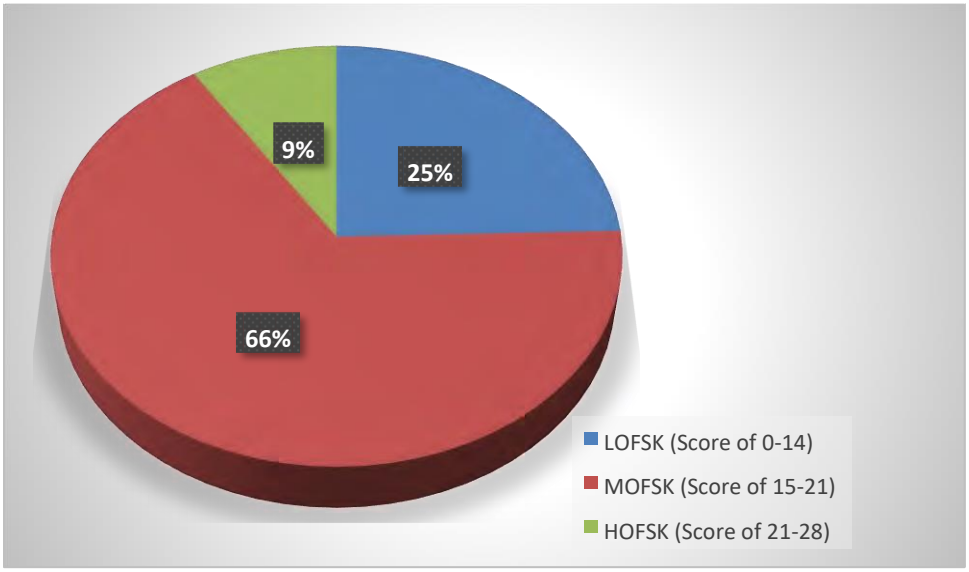

Figure 4 4: An assessment of the overall food safety knowledge (total score: 28)

4.7. The food safety attitude of consumers

The food safety attitude of consumers is presented in Table 4.7, eighty percent of respondents agreed that they check the expiry dates when purchasing food to prevent food-borne illnesses. The majority (81%) of respondents agreed that they always inspect food packages for damages on the purchase phase. The majority (56%) of respondents agreed to always check for buckling or bulging on canned food products, while (9%) never check for any damages on the can. About 34% of respondents agreed to always/frequently check the cooling temperature on frozen food against the majority (66%) respondents who sometimes/rarely/never check the cooling temperature. The majority (55%) of respondents always or frequently checked storage instructions printed on the food package. The majority of respondents (52%) always or frequently followed preparation instructions printed on certain products. The majority of respondents (52%) sometimes/rarely/never checked on whether the food product is free of preservatives. Furthermore, the majority (63%) of respondents sometimes/rarely/never ensure the product is free of industrial pigments. However, the majority (88%) of respondents always/frequently indicated that they immediately store frozen food when reaching home. Moreover, the majority of respondents (78%) indicated that they always/frequently pay

attention to the cleanliness of the store where food is purchased for consumption. Generally, consumer's food safety attitudes affects practices and attitudes and the majority of respondents indicated positive reactions towards appropriate storing of food and proper handling of food products (Table 4.7).

Table 4.7: Food safety attitude of consumers in the hospitality industry

	Purchasing practice	Always (n) (%)	Frequently (n) (%)	Sometimes (n) (%)	Rarely (n) (%)	Never (n) (%)
2.1.1	Do you check the expiration date before purchasing food products?	121 71	15 9	27 16	3 2	4 2
2.1.2	Do you check for buckling or bulging food cans?	76 45	19 11	41 24	18 11	16 9
2.1.3	Do you check food packages if they have been opened or damaged?	128 75	11 6	16 9	7 4	8 5
2.1.4	Do you check the cooling temperature for frozen food?	38 23	19 11	51 30	31 18	31 18
2.1.5	Do you follow storage instructions printed on the food products?	69 41	24 14	45 27	16 9	16 9
2.1.6	Do you follow preparation instructions printed on some products?	52 30	37 22	54 32	19 11	8 5
2.1.7	Do you make sure that the product is free of preservatives?	37 22	45 26	46 27	19 11	23 14
2.1.8	Do you make sure that the product is free of industrial pigments?	31 18	33 19	54 32	20 12	32 19
2.1.9	Do you put frozen foods in the freezer immediately on reaching home?	132 78	17 10	12 7	4 2	5 3
2.1.12	Do you pay attention to the cleanliness of the store you purchase your food from?	113 67	19 11	26 15	8 5	4 2

4.8. The food safety awareness of consumers

The results in Table 4.8 show the consumer awareness perspective on food safety. Most (83%) respondents agreed to cooking beef parties until they are no longer pink as the correct preparation method. However, less than half (47%) of consumers agreed that rare and medium cooked pork is completely safe to eat, while more than half (53%) indicated strongly disagreed/disagree/don't know that it is safe to eat it. The majority (54%) of the respondents strongly agree/agree/don't know that the freezing storage method kills all bacteria which is causing sickness. The majority (89%) of respondents agreed that cooled food at room temperature before refrigeration is safe, however, 57% respondents strongly disagreed that leftover foods can be safely kept at room temperature for several hours which is a motion concluded regardless of implementing cooling methods such as stirring continuously till the food is completely cooled, or movement of food to cooler storage for more than 2hours which applies to perishable products which will be thrown away if kept more than 2hours. The majority (53%) of respondents do not know that irradiation of meat or poultry will destroy bacteria that cause food-borne illness.

Table 4.8: Consumer's food safety awareness

	Statement	**Strongly agree** (n) (%)	**Agree** (n) (%)	**Strongly disagree** (n) (%)	**Disagree** (n) (%)	**Don't know** (n) (%)
4.2.1	For greater safety, ground beef patties should be cooked until they are no longer pink	66 38	77 45	10 6	5 4	12 7
4.2.2	Pork cooked rare and medium is completely safe to eat	30 18	48 29	28 16	38 22	26 15
4.2.3	Freezing food kills all bacteria that may cause illness	18 11	60 35	19 11	44 26	29 17
4.2.4	Cooked food should be cooled to room temperature before refrigeration or freezing	91 54	59 35	6 4	8 5	5 3

4.2.5	Leftover foods can be safely kept at room temperature for several hours	21 12	52 31	38 22	43 25	16 10
4.2.6	Irradiation of meat or poultry will destroy bacteria that causes food-borne illness	17 10	63 37	14 8	15 9	61 36

4.9. The management's commitment to food safety

The results in Table 4.9 indicate that 33% of managers monitor staff on food safety applications and procedures on a weekly and twenty-five percent agreed to monitoring on monthly basis. The majority of managers (74%) indicated that they are delegating their food safety monitoring duties to any other staff member and about 40% of the managers indicated that the health inspectors/ environmental health officers visit them twice a year.

Table 4.9: The management commitment to food safety (N=101)

MANAGEMENT COMMITMENT TO FOOD SAFETY		Frequency (n)	Percentages (%)
Q2.1 How often do you monitor your staff regarding the application of food safety and procedure manuals?	1 Daily	32	31
	2 Weekly	33	33
	3 Monthly	25	25
	5 Once in 6 months	11	11
	6 Once a year	0	0
	7 Never	0	0
Q2.2 Do you delegate any of the food safety monitoring duties to any other staff members?	1 Yes	75	74
	2 No	26	26
Q2.3 How frequently does an Environmental Officer/Health inspector visit your facility? (Select one).	1 Monthly	17	17
	2 Once in 6 months	28	28
	3 Twice a year	41	40
	4 Once a year	15	15

	5 Once in more than a year	0	0
	6 Never	0	0

4.10. Hospitality managers' views on the existence of food safety policies and procedures

In Table 4.10, the majority of managers confirmed to have written policies and procedures on receiving stock (94%), hygiene (83%), administration (98%) whereas 63% and 58% of managers indicated that they did not have storage and serving policies. Ninety-five percent of participants confirmed that the organisation's written policy and procedures on personal hygiene tailored for employees and all visitors. In addition, 66% of managers indicated that personal hygiene policy and procedures are followed by every individual entering the production or service area.

Table 4.10: The review of managers on food safety policies and procedures (N=101)

			Frequency (n)	Percentages (%)
Q3.1Are there written policies and procedures regarding each of the following?	Q3.1.1 Receiving	1 Yes	95	94
		2 No	6	6
	Q3.1.2 Storage	1 Yes	37	37
		2 No	64	63
	Q3.1.3 Serving	1 Yes	42	42
		2 No	59	58
	Q3.1.4 Hygiene	1 Yes	84	83
		2 No	17	17
	Q3.1.5 Administration	1 Yes	99	98
		2 No	2	2
Q3.2.1 Are written policies and procedures for personal hygiene for employees and all visitors in place and documented?	1 Yes		96	95
	2 No		5	5
	1 Yes		67	66

Q3.2.2 Are personal hygiene policies and procedures followed by every person who enters the production or service area?	2 No		34	34
Q4.1 Indicate which of the following guidelines have been developed in your facility	4.1.1 Food storage procedures	Yes	98	97
		No	3	3
	4.1.2 Procedures for personal hygiene of foodservice staff	Yes	77	76
		No	24	24
	4.1.3 Cleaning and disinfection of surfaces and equipment	Yes	40	40
		No	61	60
	4.1.4 Temperature monitoring of foods	Yes	24	24
		No	77	76
4.2 Have educational courses or trainings on HACCP (Hazard Analysis and Critical Control Points) and food hygiene for foodservice staff been given?	1 Yes		89	88
	2 No		12	12
4.3 Early/During the previous year, did you provide employees an opportunity to attend a food safety certification program?	1 Yes		83	82
	2 No		18	18
4.4 Did the food handlers receive training?	1 Yes		99	98
	2 No		2	2

The majority (97%) of managers indicated that the guidelines have been developed for food storage procedures, and (76%) of managers indicated that the guidelines for personal hygiene have been developed for foodservice staff. However, 60% managers reported that guidelines for cleaning and disinfecting surface and equipment were not developed while, 76% reported that temperature monitoring guidelines for foodborne bacteria have not been developed.

In training, 88% of managers received educational courses training on Hazard Analysis and Critical Control Points, and food hygiene designed for foodservice staff. Moreover, the majority of managers (82%) confirmed that employees were afforded an opportunity

to attend a food safety certificate program and also 98% of managers received food safety training for food handlers.

4.11. Association between demographic and food safety knowledge using Chisquare test

The non-parametric tests (Chi-square (X2), Manne-Whitney U, and Kruskale-Wallis) of the association between the demographic characteristics of participants and food safety knowledge are presented in Table 4.11. Results showed that there was a significant association between gender and temperature control ($p < 0.05$). A significant association was also found between job position and overall food safety knowledge ($p < 0.05$). Table 4.12 shows that there was a significant association between age and food safety attitude ($p < 0.05$).

Table 4.11: Association between food handlers' demographic and food safety knowledge using Chi-square test (N=110)

	Personal Hygiene Knowledge	**Knowledge on microbial hazard**	**Temperature control for food safety knowledge**	**Overall food safety knowledge**
Q1.1 Gender	*χ2 = 0.471* *P = 0. 790*	*χ2 = 0.904* *P = 0.636*	***χ2 = 7.997*** *CT1* ***P = 0.018***	*χ2 = 2.142* *P = 0.343*
Q1.2 What is your age?	*χ2 = 16.206* *P = 0.113*	*χ2 = 6.082* *P = 0.414*	*χ2 = 11.422* *P = 0.076*	*χ2 = 4.650* *P =0 .589*
Q1.3 Which of the following best describes your level of qualification?	*χ2 = 17.989* *P =0 .221*	*χ2 = 18.141* *P =0.20*	*χ2 = 11.744* *P = 0.0163*	*χ2 = 9.731* *P = 0.284*
Q1.4 Years of experience in Foodservice Unit	*χ2 = 21.592* *P = 0.606*	*χ2 = 8.667* *P =0 .371*	*χ2 = 22.078* *CT6* *P = 0.405*	*χ2 = 3.092* *P =0 .928*
Q1.5 Do you have previous experience in foodservice before current position?	*χ2 = 2.944* *P = 0.229*	*χ2 = 3.977* *P =0.859*	*χ2 = 2.443* *P = 0.295*	*χ2 = 1.268* *P = 0.530*
Q1.6 Which one below represents your work activity (job description)?	*χ2 = 8.197* *P = 0.0414*	*χ2 = 11.359* *P = 0.182*	*χ2 = 11.964* *P = 0.153*	***χ2 = 19.727*** ***CT9*** ***P = 0.011***

Q1.7 Have you attended any food safety training course in which you	*χ2 = 5.156* *P = 0.272*	*χ2 = 19.115* *P = 0.201*	*χ2 = 6.557* *P = 0.100*	*χ2 = 17.273* *P = 0.402*
were offered a certificate?				
Q1.8 Are you currently utilising a HACCP program/monitoring system in your foodservice unit?	*χ2 = 1.347* *P =0.510*	*χ2 = 0.679* *P = 0.712*	*χ2 = 3.904* *P = 0.142*	*χ2 = 5.625*[1] *P = 0.060*

Table 4.12: Association between consumer demographic and food safety attitude and awareness using Chi-square test (N=110)

	Attitude	**Awareness score**
Q1.1 Gender	*χ2 = 11.733* *P = 0.303*	*χ2 = 6.076* *P = 0.415*
Q1.2 What is your age?	***χ2 = 62.343*** ***P = 0.013***	*χ2 = 27.401* CT1 *P = 0.286*
Q1.3 Which of the following best describes your level of qualification?	*χ2 = 60.205* *P = 0.153*	*χ2 = 45.038* CT2 *P = 0.538*

4.12. Cross-tabulation between food safety knowledge variables

Figure 4.5 below shows the cross-tabulation between gender and food safety knowledge. The figures indicate that the majority of females had low food safety knowledge regarding temperature control in comparison to males. Notably, more males had moderate temperature control food safety knowledge, and the majority of female participants had moderate temperature control food safety knowledge.

The cross-tabulation between job positions and total food safety knowledge indicates that the majority of food handlers had a moderate total food safety knowledge and higher total food safety knowledge compared to scullery, cleaners and supervisors (Figure 4.6). The cross-tabulation between age and food safety attitudes indicates that the majority of participants under 25 years of age had low food safety attitudes, however, the participants

between 25 and 35 had moderate to good food safety attitudes. The participants from 36 to 45 years of age had a low to good food safety attitudes (Figure 4.7).

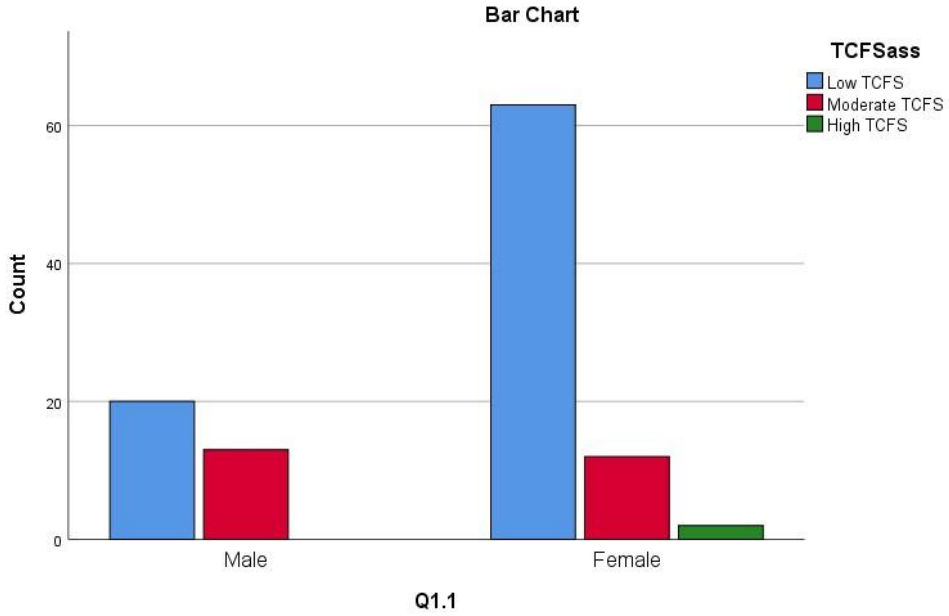

Figure 4 5: Cross tabulation between gender and temperature control for food safety knowledge of respondents

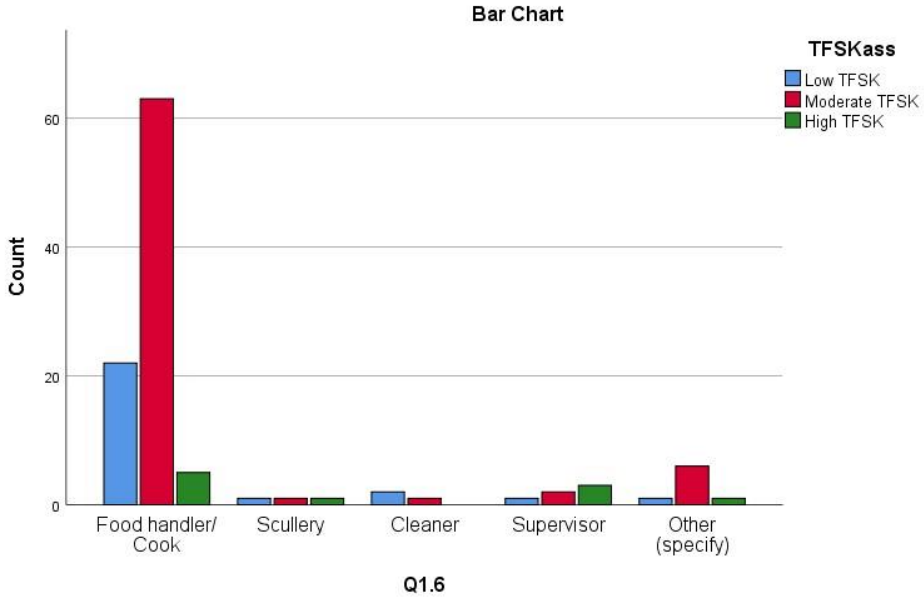

Figure 4 6: Cross tabulation between job position and total food safety knowledge of respondents

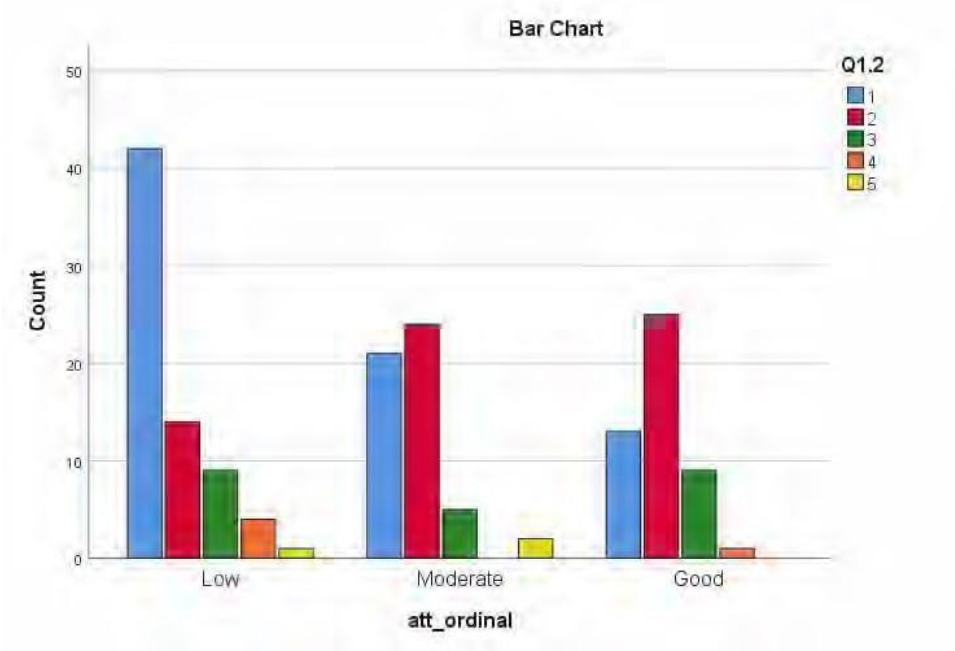

Figure 4 7: Cross tabulation plot of age and food safety attitude

1: Under 25 years, 2: 25-35 years, 3: 36-45 years, 4: 46-55 years, 5: 56-65 years & 6: Over 65 years of age.

4.13. Correlation among food safety knowledge variables

Table 4.13 shows a small positive correlation between the overall food safety knowledge and personal hygiene [r = 0.724, n =110, p<005], microbial hazards [r = 0.815, n =110, p<005], temperature control [r = 0.612, n =110, p<005] scores of the food handlers. Furthermore, the results indicated positive correlation between Personal Hygiene Knowledge and Knowledge on microbial hazards [r = 0.440, n =110, p<005], Knowledge on microbial hazards and Personal Hygiene Knowledge [r = 0.440, n =110, p<005], as well as Knowledge on Temperature control and microbial hazards for food safety knowledge [r = 0.300, n =110, p<005]. Correlation is significant at the 0.01 level when p = 0.008.

Table 4.13: Correlation between the scores of food safety knowledge parameters (N=110)

	Personal Hygiene Knowledge	Knowledge on microbial hazard	Temperature control for food safety knowledge	Overall food safety knowledge
Personal Hygiene Knowledge	1	.440**	.076	.724**
Knowledge on microbial hazard	0.440**	1	0.300**	.815**
Temperature control for food safety knowledge	0.076	0.300**	1	0.612**
Overall food safety knowledge	0.724**	0.815**	0.612**	1

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

4.14. Overall assessment of food safety attitude and awareness

Figure 4.8 indicates that 66% of food handlers had moderate knowledge on food safety and awareness as compared to 9% who indicated high levels of knowledge and awareness and 25% of food handlers had poor food safety knowledge. Figure 4.9 indicates that 71% of participants had a low level of awareness of food safety while 25% had a moderate level of food safety awareness. Only 4% of participants had a good level of food safety awareness.

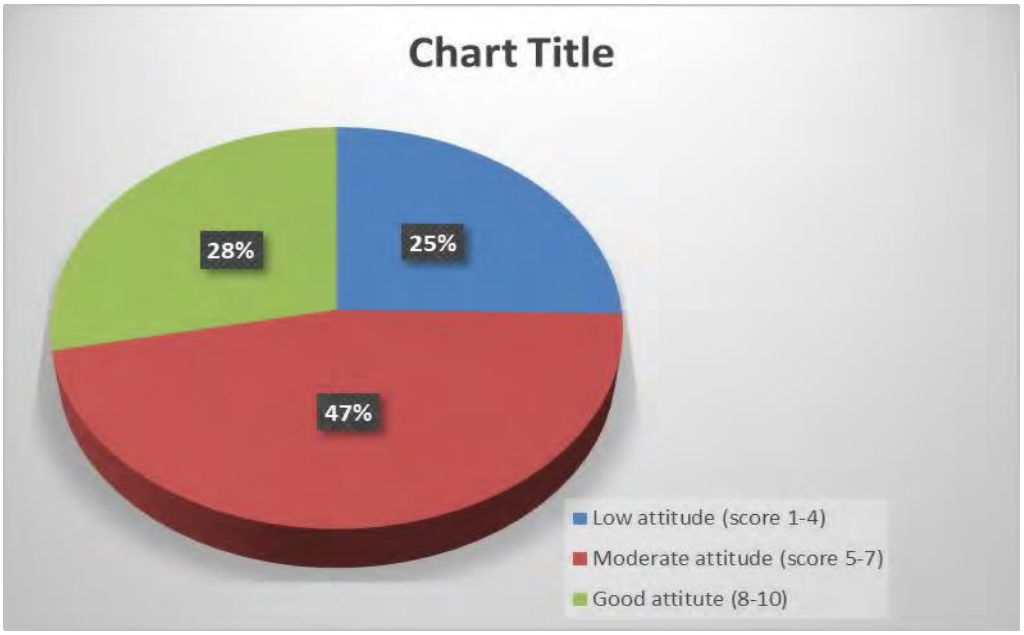

Figure 4 8: Overall assessment of food attitude

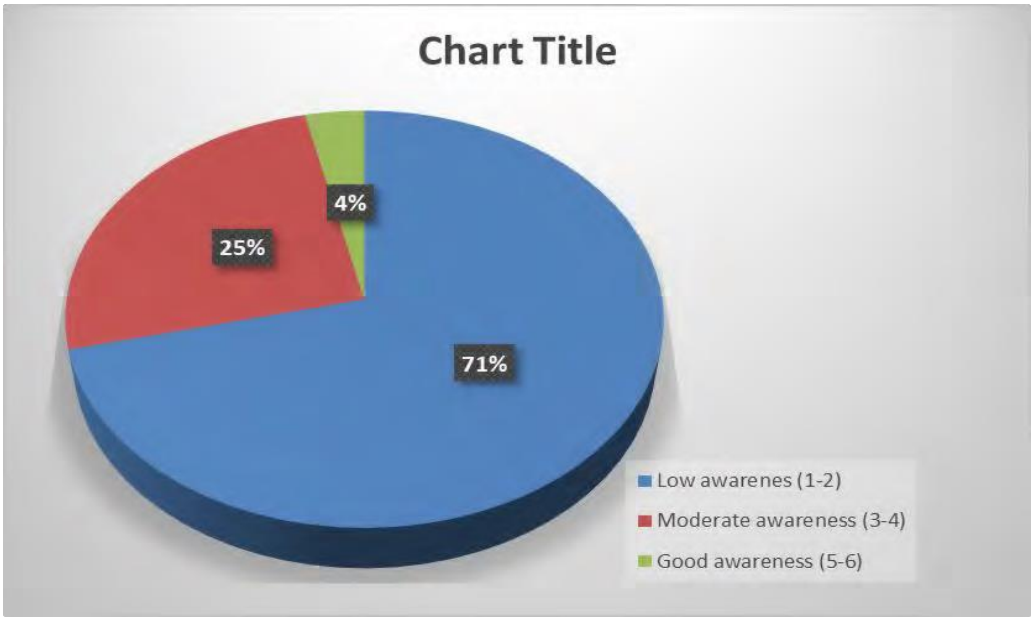

Figure 4 9: Overall assessment of food awareness

5. DISCUSSIONS

5.1. Introduction

This chapter provides an overview of the results. The chapter further discuss the results, provides conclusion to this study and present recommendations based on results.

5.2. Demographic information of the food handlers

A total number of 110 food handlers participated in this study. When analysing the results of this study, it is evident that the majority (70%) of food handlers working in the King Cetshwayo District were females. This was consistent with the findings of the study conducted in Malaysia where most food handlers in foodservices (60.7%) were also females (Alqurashi *et al*. 2019). Similar findings were noted in the study in the food and drinks establishments in the city of Gondor, Ethiopia with the majority (88%) as females (Azanaw et al., 2019). Furthermore, another study conducted in Brazil also reported that the majority of food handlers in hotels and restaurants (52.8%) were females (Reboucus *et al*. 2016). The reason why the majority of respondents were females is maybe because majority (83,3%) of the population of KwaZulu Natal comprises of females (Zululand District Municipality, 2018). Also, females dominate the South African population (Statistics South Arica, 2016).

The participant's age in this research was 18 years and older. A larger portion of respondents (47%) were between 25-36 years of age. Similarly, the age group used in another study conducted in South Africa, most respondents (47%) were aged between 25-44 years (Mjoka & Selepe, 2018). Moreover, in Nairobi, Kenya, the majority of food handlers were between 26-30 years (Rotich, Burug & Chalimo, 2017). On the contrary, in another study compiled in Malaysia, the majority of respondents were between 18-55 years (Rosmawati *et al*., 2015). It may be the case that most food handlers the age between 23 and 36 years are in their early years in their careers and have a need for growth in the industry.

The educational profile of food handlers in this study, indicated that majority (47%) had attained undergraduate certificates with skills as a qualification. The findings were contrary to the study conducted in Brazil with the majority of food handlers (52.8 %)

having completed secondary school education (Reboucus *et al*., 2016). On the contrary, in another study compiled in Saudi Arabia, most food handlers in foodservice (57.7%) had university degrees (Alqurashi, Priyadarshin & Jaiswal, 2019). Furthermore, in another study based in Egypt the majority of food handlers (33.6%) in the hospitality industry were qualified graduates from hotel institutions and colleges (Hussein & Gadeelral, 2016). The level of education in the studies conducted in Brazil, Saudi Arabia and Egypt is higher compared to the results of this study. The reason may be attributed by increasingly more access to technical education vocational, education and training institutions.

Regarding work experience, in this study, most of respondents (54%) had less than five years of work experience in the foodservice unit. The findings in the present study are consistent with the findings of Mjoka and Selepe (2018), where the majority of respondents (52.6%) with 1-6 years of experience in the foodservice areas in South African hotels. On the contrary, in the study conducted in Kenya, the majority of food handlers (44.3%) had more than two years of work experience in the service of food (Rotich, Burug & Chalimo, 2017). Furthermore, in the previous study compiled in four and five-star hotels, Egyptian food handlers were reported to have varied work experiences Gadelrab & Husssein ,2016). The reason for most respondents having experience may be because of being permanently employed in foodservices establishments. The results of this study showed that that the majority of respondents (82%) were employed as food handlers in the food preparation area. The findings in the present study are consistent with the findings of a study by Reboucus *et al.* (2016) conducted in Brazilian hotels and restaurants with the majority of respondents (87.4%) also employed as food handlers in the food preparation area. Similarly, in another study done in Nigeria, the majority of respondents (78%) were employed in hotels, restaurants and cafeterias as food handlers (Iwu *et al*., 2016). Furthermore, in another study compiled in Egypt, all respondents (100%) were employed food handlers in food production service areas of the hotel (Gadelrab & Husssein, 2016).

On training matters, food handlers attend training to improve levels of food safety knowledge and to prevent food-borne incidences (Lee *et al*., 2017). In this study, the majority (70%) of respondents attended food safety training courses and obtained

certificates. Similarly, in Kenya, food handlers were trained on food safety and certified, and were targeted for undergraduate and post graduate educational programs (Kang'ethe *et.al*., 2019). On the contrary, there are similarities between Hussen and Gadeelral (2016) and those described by Alqurashi, Priyadarshin and Jaiswal (2019) with the majority of respondents receiving training on food safety and hygiene but not receiving certificates for this reason, that food handlers attend training to gain better food safety knowledge, good food handling practices, proper food safety practices, a positive attitude towards food safety and better work performance (Azanaw *et al*., 2018). This study revealed that the majority of respondents (70%) had different levels of education, years of experience and different work activities were displayed through the use HACCP program. The HACCP is the monitoring system to control food safety and combat risks (Manning, 2018). The findings in the present study are consistent with the Egyptian four and five-star hotels findings with the majority of food handlers (87.4%) reported to understand of the use of HACCP and the application thereof effectively for risk and risk management (Hussen & Gadeelral, 2016). Similarly, in another study by Alqurashi, Priyadarshin and Jaiswal (2019), the majority of foodservice staff at 68.8% understood HACCP and were utilising the program. These findings contrast the study conducted by Reboucus *et al*. (2016) with a minority (35%) of food handlers understanding HACCP. The use of the HACCP program in any foodservice establishment is to have proper identification, analyse and control food safety hazards, improve food safety handling practices and protect consumers from food hazards in the hospitality industry (Griffith, Jackson & Lues, 2017).

Regarding designated safety assurance officials onsite or in the area of work, the majority of respondents (70%) confirmed being aware of such officials. Similarly, the previous study compiled in the United States reported the existence of restaurant sanitation inspectors appointed by the Department of Health. The inspectors were reported to have enforced food safety practices for consumers to gain trust in the food industry (Matheus *et al.*, 2016). Furthermore, the findings of this study are similar to Graffith *et al*.'s (2016) study reporting on the existence of food auditors appointed by the establishment annually to establish food safety strategies. Additionally, in another study compiled in South Africa,

the majority (57.4%) of respondents confirmed to be aware of inspections as a tool to reduce food-borne diseases (Bisholo, Ghuman & Haffejee, 2018). It is for this reason that South Africa's safety assurance officials inspect food areas for compliance on behalf of local municipalities (RSA Department of Health, 2004). Regarding cleaning tools, the majority of respondents (88%) in this study, indicated having cleaning tools. The findings in the present study are consistent with the findings of Zulfan and Ahmad (2019) in Medan city with the majority (81.7%) indicating the availability of cleaning equipment in the workplace. Furthermore, the majority of respondents (62.5%) reported receiving cleaning tools and equipment such as detergents, sanitisers, sponges, and disposable cloths in the workplace (Reboucus *et al.,* 2016). However, contrary in a study conducted in Ghana, the majority (36.6%) reported the availability of cleaning tools provided by the workplace with no cleaning checklist (Odonkor & Odonkor, 2020).

5.3. Demographic characteristics of consumers

This study showed that most (65%) respondents were females. The majority of respondents (45%) were under 25 years of age, followed by those between 25 and 35 years (37%). The results of this study are similar to the study by Kilic and Eryilmaz (2018) conducted on consumer's awareness of food safety based in Turkey, which had majority (65%) female respondents, (45%) of these respondents were between 35-49 years of age. On the contrary, in another study completed in fast-food restaurants in Barisal City, Bangladesh, the majority (60%) of respondents were males between 16 and 25 years (Atikuzzamman *et al*., 2018). In the current study, most of the respondents (26%) have attained diploma level education from a university of technology as the highest level of education, while only a few (8%) have attained postgraduate degree, the rest of the respondents (25%) attained a vocational certificate and skills certificate, and only (11%) attained a university degree as the highest qualification (Table 1). On the contrary, in a study completed in fast-food restaurants in Barisal City, Bangladesh 31.6% of respondents obtained a school leaving certificate with a minority (10%) in possession of an MBA (Atikuzzamman *et al*., 2018). Additionally, in a study done in Saudi Arabia, the majority of consumers (76%) also attained a university degree as the highest educational

level (Ayaz, Priyadarshini & Jaiwal, 2018). Furthermore, in another study conducted in Swaziland, the majority of consumers (68%) attained tertiary education with 19.9% having completed high school education (Ndwandwe & Weng, 2017). The reason why majority of concumers had a qualification higher than a high school qualification can be attributed by more access to higher education (Council on Higher Education, 2015).

5.4. Demographic characteristics of managers

The reason why majority of respondents were females could be attributed to the South African government gender equality Act and the high number of females working in the hospitality industry. Furthermore, women's economic empowerment has increased the attention in global development agenda which has bolstered the adoption of a range of relevant targets within the Sustainable Development Goals (SDGs) in 2015. The study revealed that 44% of the managers had a university of technology diploma as the highest level of education followed by 20% with skills certificate which is similar to the study conducted in Greece conducted by Marinakou (2014) that indicated that more respondents had undergraduate qualifications. This could be attributed to a high number of hospitality programs offered in South Africa offered as a vocational program in the universities of technology and comprehensive universities (Ezeudujia, Chibe & Nyathela, 2017). The hospitality management program is vocational hence only 8% of managers had a post-graduate degree which may not be the requirement for most positions in middle management.

5.5. Food handler's personal hygiene knowledge and practices

This study found that majority of food handlers (38%) displayed good personal hygiene practices with adequate knowledge. Similarly, findings of the study done in Nigeria had the majority of food handlers (74%) with good personal hygiene through clean and neat uniforms with an apron, neat hair without coloring and neatly trimmed nails (Iwu *et al*., 2017). Equally, in a study by Reboucus *et al*., (2016), it was found that the majority of food handlers based in Brazil (88%) displayed good personal and hand hygiene practices. On the contrary, in Turkey, 10.6% of food handlers displayed failure on personal hygiene

practices through long nails (Yalrdirim *et al*., 2020). Personal hygiene is necessary for safe food handling and prevention of food-borne diseases (Gadelrab & Hussein, 2016).

General handwashing is important and is to be performed frequently by food handlers before and during food preparation. The results in this study indicated that the majority of respondents (62%) performed handwashing using soap, warm running water and wiping dry with a paper towel as the procedure in food preparation. Similarly, a study conducted by Iwu *et al*. (2017) in Nigeria, the majority (60%) of food handlers washed hands with soap and dried with a paper towel. On the contrary, in another study, Brazilian food handlers used antibacterial soap and tap water to wash hands (Reboucus *et.al*., 2016). In addition, a study done by Matheus *et al.,* (2016) showed that few food handlers were able to wash their hands applying the correct handwashing procedures in the United States of America. The reason for washing hands with water and soap frequently is the implementation of precautionary measures to prevent food contamination and foodborne diseases (WHO, 2017).

Hand hygiene compliance is a practice used to prevent foodborne outbreaks and effective hand drying practice is essential to prevent the spread of germs in food. The research findings showed that most food handlers prevented water from dripping by drying their hands with an air dryer. On the other hand, another study conducted in South Africa to assess compliance of drying hands after washing. Most food handlers were using paper towel to dry their hands to prevent bacterial spread (Mjoka and Selepe, 2018). Furthermore, in a study done in Brazil, most food handlers also wash hands with antiseptic soap and use paper towels for drying (Reboucus *et.al*., 2016). On the contrary to this study, in Zaria, Kaduna State and Nigeria majority of food handlers wiped hands with personal clothing or an unclean kitchen towel which could result in cross-contamination (Abdullahi, Maiha & Lawal, 2020).

The majority of food handlers were aware of preventing contamination by storing clothes in a locker or storeroom. Alike, Philippines foodservices staff also reported storing used uniforms, clothes and personal belongings in a locker to prevent cross-contamination (Ailigan- Manzano, 2016). However contrary to this study in Delhi, India in a study done by Kumari and Kapur (2018), the majority of food handlers in the catering-based

establishments reported that there is no provision of lockers nor change rooms. Moreover, in Ghana most food handlers reported not using the same pair of clothes within and outside the food production area and were provided with change rooms and lockers to prevent cross-contamination (Nartely *et al*., 2017). The majority of food handlers were aware of symptoms leading to sicknesses such as flu or diarrhoea, as well as the necessity to take medication, rest and then return to work after receiving medical clearance. On the other hand, a study that was performed in Turkey, most food handlers in the food and beverage industry were unaware that diarrheal infections threaten life and require medical attention and clearance (Yaldrim *et al*., 2019). Additionally, in the City of Pakistan, Ahmed *et al*. (2017) reported that 40% of respondents were aware of diarrhea, vomiting and abdominal pain as symptoms of food-borne diseases that require medical attention to prevent spreading but were not concerned with medical clearance for return to work. Furthermore, in a previous study done in Ghana, the majority of food handlers in the food industry reported not being allowed to work when coughs and colds develop and the focus thereafter is on annual medical screening (Odonkor & Odonkor, 2020).

Regarding food-borne symptoms, the majority of food handlers in this study knew that they have to refrain from work when developing food-borne symptoms. The findings in the present study are consistent with the findings of Reboucus *et al*. (2016) where the majority of food handlers took leave from work when suffering from a lesion or showing food-borne symptoms. Also, a study done in Ghana, the majority of food handlers abstained from work when developing foodborne related symptoms (Appietu & Amuquandoh, 2020). This is due to the reason that contagious illnesses spread easily to co-workers and to consumers and is to be avoided at all time. Minor accidents such as hand cuts and minor injuries do take place in the workplace, and the majority of respondents (89%) in this study displayed the use of a bandage and non-latex gloves as aids to stop bleeding in case of minor injuries. The findings in the present study are consistent with the findings of Reboucus *et al*., (2016), where majority of food handlers wear gloves when hands have minor injuries or bruises. Also, in another study in the Philippines, the majority of foodservices staff also wore gloves when having minor cuts

or wounds (Ailigan- Manzano, 2016). Furthermore, in Ghana, most food handlers agreed that handling food with injuries causes food-borne illnesses, and that risks can be reduced by wearing gloves as protection (Nartely *et al*., 2017). Appropriate handwashing procedures are important and should be followed. Most of food handlers from this study could answer correctly the right procedure to follow for washing hands sequence beginning with wetting hands, application of soap, scrubbing, rinsing and air drying. On the contrary, in another study in South Africa, only few food handlers washed hands starting vigorously washing hands with warm water and soap for at least 20 seconds using a nail brush and dry with tissue paper. Hence most food handlers substituted handwashing with sanitising (Mjoka & Selepe, 2018). In a study done by Reboucus *et al*. (2016) fewer food handlers were aware of the correct number of steps involved in the hand washing process.

Food handlers are to refrain from wearing jewellery during food preparation. In this study, the majority of respondents were aware that jewellery is not acceptable to be worn in the food preparation area. The findings in the present study are consistent with the findings of Mjoka and Selepe (2018) who reported that the majority of South African food handlers in hotels do not wear jewellery in the food preparation area. On the contrary, in a study conducted in Ethiopia, a considerable percentage food handlers wore jewellery while handling food (Tesfaye *et al*., 2016). In addition, the findings of the study conducted in Turkey found that few food handlers wore jewellery during food preparation (Yalrdirim *et al*., 2020). The reason for avoiding jewellery during food preparation is to avoid physical contamination in food products to protect consumers from hazards.

5.6. Discussion of food handlers' microbial hazard and foodborne diseases knowledge

Foodborne diseases are caused by bacteria and it remains a food safety concern. In this study, less than 50% of food handlers possess knowledge of microbial hazard and foodborne diseases. Alike. food handler's microbial hazard knowledge at 45%. On the contrary, the study by Ahmed *et al*. (2017) found most food handlers were familiar with terms related to foodborne diseases and causes of illnesses but were not applying safe

food handling on daily routines. Also, in Kenya, most handler's had knowledge of the causes of food contamination leading to foodborne illnesses (Onyongo & Chalotte-Mapelu, 2019). Furthermore, in a study done in Ukrainian, Califonia, the majority of food handlers were aware of the link between pathogens, toxins and food-borne illnesses after six months of training (Ercan *et al*., 2020). Bacteria are the main cause of food poisoning in human beings. The findings of this study showed that most food handlers were aware of signs and symptoms relating to food poisoning as it may lead to death. Similarly, in a study conducted in Nigeria, the majority of food handlers correctly indicated diarrhoea as the most common sickness of food-borne illness (Iwu *et al*., 2017). Additionally, in a study done in the Ghanaian hospitality industry, food handlers indicated diarrhoea as a symptom leading to food poisoning (Odonkor & Odonkor, 2020). Moreover, in another study in Lusaka, Zambia food handlers displayed diarrhoea and vomiting within 48 hours as a sign relating to food poisoning (Kapaya *et al*., 2017).

Food poisoning originates from contaminated food and the majority of the food handlers of this study correctly indicated occurrence. Similarly, in Ireland the majority of respondents knew of food poisoning as resulting from contaminated food (Moreb, Priyadarshin & Knechtges, 2017). Furthermore, in Saudi Arabia, the majority of food handlers indicated they knew the definitions for food poisoning and occurrence (Alqurashi, Priyadarshin & Jaiswal, 2019). On the other hand, most food handlers in Kenya indicated that food poison is caused by bacteria, parasites and viruses (Onyongo & Chalotte-Mapelu, 2019). Bacteria need a suitable environment to grow. In this study, the majority of food handlers correctly indicated that bacteria grow faster in a warm environment. On the other hand, in a study that was performed to assess knowledge of food hygiene and safety, most Ghanaian food handlers in the food and beverage section knew that bacteria continue to grow and multiply at human temperature (Nartey *et al*., 2017).

Poor food hygiene practices may result in food-borne outbreaks. The findings of this study revealed that the majority food handlers correctly indicated that food bacteria contamination can be prevented by ensuring proper food hygiene. Similarly, in the study performed in restaurants in the United States of America to assess bacteria prevention,

most food handlers prevented outbreaks by adhering to correct procedure, proper food storage and the use of adequate cooking and cooling temperatures (Angelo *et al.*, 2016). The results in this study are similar to the findings of the study in South Africa with the majority preventing outbreaks through correct handwashing technique (Mjoka & Selepe, 2018). Furthermore, in another study conducted in Kelambaakam village, Kancheepuram District, India, the majority of food handlers also indicated proper washing of hands as a means to prevent contamination (Chellaiyan *et al*., 2018). Personal hygiene is important in food preparation. The majority of food handlers knew that continued hand washing prevent bacteria contamination. Similarly, in South Africa, the majority of food handlers knew that washing hands rapidly every time prevent contamination (Mjoka & Selepe, 2018). Also, in another study in Ghana, the majority of food handlers washed hands rapidly, changed their hair net to prevent dandruff from dropping, and bathed twice a day to prevent contamination (Nartely *et al*., 2017). Furthermore, in another study in Ethiopia, the majority of food handlers also displayed good personal hygiene through washing hands and wearing hairnets during food preparation (Nzanaw, Gebrehinot & Dagne, 2019). Thus, food handlers constantly wash hands to ensure hands do not promote contamination.

Prevention of microbial contamination is to be assured through hand washing with warm water and soap for at least 20 seconds and is to be done before, during and after food handling. The majority of food handlers had adequate knowledge. Similarly, in Ireland, the majority of food handlers also knew that washing hands with soap and warm water is important to prevent microbial contamination (Moreb, Priyadarshin & Knechtges, 2017). Hence, in a study conducted in Saudi Arabia, the majority of respondents washed hands with warm running water and soap then wipe dry to prevent microbial contamination (Alquarash, Priyadorshini & Jaiswal, 2019). On the contrary, in a study in South African study, fewer of food handlers (26.3%) washed hands with water and soap every 30 minutes during food preparation (Mjoka & Selepe, 2018).

Cross-contamination is likely to occur as a result of improper food handling. The findings of this study revealed that half of food handlers correctly indicated possibilities of cross-contamination during food preparation when mixing cooked and raw foods on one

chopping board. The findings in the present study are consistent with the findings of Reboucus *etal*., (2016) who reported that most food handlers demonstrated a reduction of cross-contamination by used separate color-coded chopping boards for raw and ready to eat meat to reduce cross-contamination. In addition, in Saudi Arabia, the majority of food handlers separated raw and cooked food during food preparation using different chopping boards (Alquarash, Priyadorshini & Jaiswal, 2019). Furthermore, in South Africa, the majority of food handlers used color-coded chopping boards and used hot water and detergents for washing equipment to prevent contamination (Mjoka & Selepe, 2018). On the contrary, in the study conducted in Ghana, most of food handlers were unaware that cooked and uncooked food should be kept separately to prevent cross-contamination (Nartely *et al*., 2017). Cross-contamination is to be avoided at all costs as it can result in food poisoning.

The growth of pathogens such as Listeria monocytogens and Salmonella can lead to food-borne infection upon consumption (Harris, Ali & Ryu, 2017). The majority of food handlers in this study, correctly answered by indicating the association of poultry products with Salmonella as the main foodborne pathogen as Salmonella is traditionally associated with poultry and eggs. Similarly, in the study done by Feltes, Aristo-Bragotto & Block (2016) in Brazil, half of outbreaks were associated with Salmonella and related to the consumption of undercooked poultry meat, eggs and undercooked pork sausage. Also, in another study conducted in the United States of America, the majority of food handlers correctly responded that raw chicken is associated with Salmonella (Green & Knechtges, 2015). The reason why the majority of pathogens are associated with poultry products is due to hazards is key information shared with food handlers in food safety education and training to ensure food safety (Machado & Cutter, 2017).

5.7. Temperature control for food safety knowledge

It is very important for all food handlers to have knowledge regarding correct food temperatures. In this study, food handlers had adequate knowledge regarding correct food storage temperatures. This may be similar as few were unaware, this means most

of them were aware in a study done in the Ghanaian food industry, most food handlers maintained standard temperatures for storing food (Odonkor & Odonkor, 2020). The general rule of the temperature danger zone is between 5ºC and 60ºC and that is when bacteria grow quickly. The results in this study reveal that less than half of the food handlers correctly indicated the correct danger zone temperature. These results are similar to those of Nartely *et al.* (2017) where less than half food handlers in the food and beverage section in Ghana indicated 60ºC as the danger zone. The findings of Onyongo and Chalotte-Mapelu (2019) in Kenya reported few food handlers had correct knowledge of danger zone being temperatures between 5ºC and 60ºC. Also, in a study done in Pastrami, most food handlers had knowledge of temperatures representing danger zone (Yalrdirim *et.al*., 2020). It is for this reason that it becomes necessary to monitor temperature when receiving raw food materials from the supplier to ensure correct temperatures (Derens-Bertheau *et al*., 2015).

Regarding thawing raw meat, most food handlers correctly indicated the bottom shelve of the refrigerator as the correct area for thawing raw meat. The findings in the present study are in contrast with the findings of Reboucus *et.al*. (2016) with most of food handlers who knew storing raw meat at the bottom shelf of the refrigerator. In addition, in a study conducted in Delhi, India food handlers reported thawing raw meat at room temperature (Kumari & Kapur, 2018). Furthermore, in another study done in South Africa, fewer food handlers knew that thawing raw meat on a lower shelf in the refrigerator as the best practice (Mgqibandaba *et.al*., 2019). The thawing process should be done as a storing process in line with temperature to control the growth of bacteria.

Understanding temperature requirements for different food is an element of maintaining food safety. Regarding the internal cooking temperature of poultry, the majority of food handlers were not aware of the minimum and less than half correctly indicated 74ºC. The findings of this study are similar to the study conducted by Teffo and Tabit (2020) in South Africa, Limpompo Province where very few food handlers correctly indicated 74ºC as internal temperature for poultry, meat and seafood. On the contrary, in a study in Nigeria, the majority food handlers indicated that internal cooking temperature must be high and be measured to 74ºC using the thermometer (Lamidi, 2016). The findings on the study

done in Neuchatel, Switzerland found that none (0%) of the food handlers in restaurants were aware of the internal cooking temperature (Panchal, Bonhote & Dworkin, 2016). Incorrect temperature poses a risk for food-borne pathogens to grow rapidly especially in undercooked poultry products and may result in food-borne disease outbreaks affecting consumers.

Different foods have different temperature requirements, so is reheating thawed food, in this study only 34% few food handlers correctly indicated 74ºC. Similarly, in the study conducted in South Africa, it was reported that few food handlers reheat leftovers (Sibanyoni, Tsabalala & Tabit, 2017). Also, in another study completed by Challaiyan *et al*. (2018) in Tamil, Nadu reported that less than half of food handlers had an understanding that reheating food can be harmful. However, in a study completed in Turkey, the majority reported to reheat food to the temperature of 74ºC (Tuncer & Akoglu, 2020).

Food thawed at room temperature contributes to dangers associated with bacteria growth and spoilage. Thawing in the refrigerator is the best way in frozen food products. In this study most food handlers knew that thawing food in the refrigerator is the best option knowledge thereof. There are similarities in the method of thawing frozen food between the present study and those described by Reboucus *et al*. (2016) with the majority of respondents in Brazil safely thawing food in the refrigerator. Contrary to the study by Moreb, Priyadarshin and Knechtges' (2017). In Ireland, food handlers did not know how to thaw raw meat, with a few of them thawing meat on a chopping board. However, in Ghana fewer food handlers had knowledge of the correct method to thaw frozen foods (Appietu & Amuquandoh, 2020). The reason for the use of a proper thawing method is to prevent growth and multiplication of bacteria.

Regarding appropriate storage of prepared food for the duration of 2hours, less than half of food handlers agreed that food is to be placed in the kitchen counter until ready to eat. However, in a study done in Western Ghana, the majority of respondents reported to put food for 3-4 hours on the table counter and reheat before consumption (Ondokor, Kurantin & Sallar, 2020). Hence, in another study conducted in Ghana, most of food handlers working as caterers reported that food is to be served within 2hrs after preparation

(Nartely *et al*., 2017). In another study completed in Turkey, most food handlers had knowledge that prepared food having have to be served and consumed not later than 2hrs after preparation (Tuncer & Akoglu, 2020).

Cooling a large pot of hot soup requires cleaning a shallow pan to refrigerate. In this study, the majority of food handlers did not know the safest way to cool a large soup pot. These results are similar to those of the study completed in South Africa where majority of food handlers did not know the safest way to cool a large pot of hot soup (Sibanyoni, Tsabalala & Tabit, 2017). On the contrary, Panchal, Bonhote and Dworkin (2016) reported that a fewer of restaurant food handlers in Switzerland indicated that the hot soup in a large pot smaller containers and stored in a refrigerator to cool.

The correct method to store hot food product, requires that the pot is to be cooled at room temperature and then be cooled in the refrigerator. The findings in this study only few food handlers responded correctly. Correspondingly a study in Brazil, reported only a few food handlers knew the correct temperature to cool food before refrigeration (Reboucus *et al*. 2016). On the other hand, in a study done in Ghana the majority of food handlers knew that hot food must be cooled at room temperature before refrigeration (Nartely *et al*., 2017). Moreover, in a study conducted by Tuncer and Akoglu (2020) amongst Turkish food handlers, showed that food handlers knew that food should be placed in shallow containers for quick cooling.

Regarding an appropriate method to refrigerate hamburger patties, less than half of food handlers indicated that patties are stored in a refrigerator on a duration of one day or two days. Contrarily, to the study done in Mpumalanga, South Africa majority of food handlers had knowledge on the correct storage of hamburgers in the refrigerator to prevent microbial growth (Sibanyoni, Tsabalala & Tabit, 2017).

5.8. Food safety knowledge and awareness of food handlers

Food handlers play an important role in food preparation as well as selling of safe to eat food for consumers (Jasmine, Laganathan & Mallikas, 2018). In this study, the majority had good food safety knowledge and awareness. Furthermore, in another study done by Tuncer and Akoglu (2020), the majority of Turkish food handlers in hotel kitchens had

average knowledge on food safety. On the other hand, a study was performed in Ghanaian hospitality industry, more than half restaurant food handlers also had good knowledge on food safety principles (Ondokor & Ondokor, 2020).

These observations are in line with results generated by levels of education in food safety. This is different from the study done in Malaysia by Low *et al*. (2016) in which food handlers' knowledge was influenced by factors such as gender, age and levels of education. According to the study, majority females, food handlers above the age of 30 years and with post-graduate qualifications were knowledgeable and more aware of food safety. In this study, a significant correlation was found between the level of education and awareness of food-borne diseases/illnesses and how they can be prevented (Nartey *et al.,* 2017).

In this study, a significant association was found between job position and food safety knowledge. Similarly, a study conducted by Teffo and Tabit, (2017) found a significant association between age and food safety attitude, which may be attributed to the participants' lower level of education however, the conducted in Bulgariano on food safety knowledge and hygiene practices found no significant relationship between age and food safety knowledge (Stratev, Odeyemi, Bamidele & Pavlov, 2017).

The cross-tabulation between job positions and total food safety knowledge indicates that the majority of food handlers had a moderate total food safety knowledge and higher total food safety knowledge compared to scullery, cleaners and supervisors. This indicates that the higher the position the more knowledgeable is the foodhandler in food safety knowledge. It is understandable for food handlers to have better total food safety knowledge than the scullery and cleaners, however, it is concerning that these food handlers have better total food safety knowledge than the supervisors as supervisors are expected to have high total food safety knowledge. This is similar with the study conducted by in Ghana (Akabanda, Hlortsi, & Owusu-Kwarteng, 2017). The crosstabulation between age and food safety attitudes indicates that the majority of participants under 25 years of age had low food safety attitudes, compard to between 25 and 35 who had moderate to good food safety attitudes. In contrast Stratev, et al. (2017) study showed no significant relationship between age and food safety knowledge.

However, the participants from 36 to 45 years of age had a low to good food safety attitudes. It is concerning that the higher age of participants had a low to good food safety attitudes as with their experience in the food industry, it is expected that their food safety attitudes should be good compared to the participants of lower ages.

5.9. The food safety attitude of consumers

The results of this study indicated that the majority of respondents agreed to consider food safety issues when purchasing. This means that consumers are conscious about food safety. Many of the respondents (71%) agreed to always check expiry date before purchasing food products. These results are similar to those of Lamid (2016) amongst school students in Ile-Ife Nigeria with the majority of respondents (70.2%) reported to have knowledge of checking expiry dates to observe if the product is safe or unsafe for consumption. The research completed by Odebowale and Kassim (2017) in Ogun State, Nigeria on assessing consumers' knowledge of food safety and practices revealed that 95% of respondents checked food expiry dates. Moreover, a research study completed by Madhwal and Sharma (2019) assessing consumers' procurement practices in Ludhiana District, India also reported that the majority of consumers (68%) checked expiry date before purchasing food products.

Most respondents (45%) always check for buckling or bulging on canned food products while a minority of 9% never check for any damages. The findings of this study are similar to those yielded by the study completed in Ile-Ife, Nigeria with the majority of respondents (44.5%) reported to have knowledge of the importance of checking for any damages on the tinned food products before consumption (Lamid, 2016). Furthermore, in a study completed in Tabriz, Iran assessing knowledge and attitude towards health and food safety, 58.3% respondents reported to have knowledge that canned food with damages is unsafe for consumption and should be discarded (Dehghan *et al*., 2017). The results on this study are similar with almost all respondents (95.3%) on the study completed in Western Ghana assessing safety practices amongst mothers reporting that respondents were checking canned food for dents before buying (Ondokor, Kurantin & Sollar, 2020).

Consumers who buy ready to eat foods are often interested in convenience rather than issues of food safety. Most respondents (75%) agreed to always checking on food packages for pre-opening or damage. These results are similar to the study compiled by Moy, Alias and Jani (2018) in Kuala Lumpur, Malaysia among the youth who reported that the majority (86%) checked food packages inspecting if food products were not previously opened. Furthermore, in a study completed in Ludhiana District, India, 32% of respondents demonstrated checking food packages for pre-openings before purchases (Madhwal & Sharma,2019). On the contrary, Ologbon *et al*. (2019) completed a study on quality and food safety awareness of ready to eat foods with 76% of respondents reported to rarely check damages on food packs before purchase. A few consumers are probably not aware of checking cooling temperature on frozen food and 23% always check cooling temperatures. The findings of this study are similar to results of the study compiled in in Ludhiana District, India with (25%) as respondents demonstrating lack of cooling temperature for frozen foods as a procurement practice (Madhwal & Sharma,2019).

Most respondents (41%) always checked storage instructions printed on the food package with a minority (9%) who never checked instructions. The results of this study are similar to those completed by Madhwal and Sharma (2019) in Ludhiana District, India reporting 40% as respondents who displayed knowledge to beware of packages labels with instructions for cooking and handling food products. This is in contrast to the results of the study by with Dehghan *et al*. (2017) in Tabriz, Iran with over 95% respondents demonstrating checking nutrition information on food labels but not storage instructions. Furthermore, a study completed by Ondokor, Kurantin and Sollar (2020) in Western Ghana also reported 97.7% of respondents demonstrating reading instructions of use from the package.

About 30% of the participants always followed preparation instructions printed on certain products and very few (5%) never followed preparation instructions. This is on contrast to the study by Madhwal and Sharma (2019) in Ludhiana District, India with majority

(85%) respondents demonstrated reading food labels also following cooking instructions for all foods as a priority. Furthermore, in a consumer survey completed by New *et al.* (2016) in Malaysia on microwave oven safety, the majority of consumers (56.1%) were reported to perceive food labelling with food preparation instructions for cooking and reheating as important. Moreover, in another study compiled to determine food practices among youth in Kuala Lumpur, Malaysia, the majority (65%) of respondents demonstrated following preparation instructions on the food product (Moy, Alias & Jani, 2018).

Most respondents (27%) were not sure if a food product is free of preservatives. The findings on this study are similar to those of Zhong *et al.* (2018) who assessed the Chinese consumers' willingness to accept additives revealing that 41% of respondents had little knowledge on preservatives. Furthermore, a study completed by Dehghan *et al*. (2017) in Tabriz, Iran revealed that more than 60% of respondents had poor knowledge and attitude on food additives and food safety. Moreover, in another study completed by Ha, Shakur and Do (2019) amongst consumers in Hanoi, Vietnam, 88.8% respondents reported to have concerns over food preservatives and considered them as food hazards. The majority of respondents (32%) sometimes ensure the product is free of industrial pigments. This is in contrast to respondents (63.2%) on the study among youth in Kuala Lumpur, Malaysia who demonstrated checking industrial pigment in food products (Moy, Alias & Jani ,2018). The majority of respondents agreed to immediately store frozen food immediately when reaching home (78%). These results are similar to those of Olgabon *et al*. (2019) on the study compiled to assess quality and food safety awareness amongst Yewa communities of Ogun State, Nigeria with 79% of respondents reported to store frozen food in the freezer immediately when reaching household. Similarly, Madhwal and Sharma (2019) had the majority of respondents (84%) in Ludhiana District, India reported to always put frozen foods in the freezer immediately on arriving home. Moreover, in another study completed in Ile-Ife, Nigeria, the majority of respondents (58.7%) were also reported to store frozen food immediately when reaching home (Lamid, 2016).

Most respondents (67%) agreed to pay attention on cleanliness of the store where food is purchased for consumption. Furthermore, in another study compiled in Kuala Lumpur, Malaysia, 84.4% of respondents agreed to take note of the cleanliness of the cafeteria (Moy, Allias & Jani, 2018). Moreover, a study by Nguyen *et al*. (2018) in Hanoi, Vietnam reported that 58.4% of respondents also confirmed choosing clean facilities especially in the food preparation area for food purchasing. Madhwal and Sharma (2019) also reported that 48% of respondents in India paid attention to the cleanliness of the store when making food purchases.

5.10. The food safety awareness of consumers

The results as seen in Table 3 indicate that the majority (45%) of consumers confirmed their awareness of greater safe cooking of ground beef patties to be beyond a pink color to ensure food safety. Furthermore, a study completed in the United Kingdom assessing burgher trends, reported that 34% of respondents chose well done burghers as safe to eat to guard against being exposed to E. coli (Pannington *et al*., 2019). In another study completed in by Soon *et al.* (2020) amongst consumers in Malaysia assessing food safety knowledge and attitude, 82.2% of respondents confirmed cooking beef patties till clear and not pink to determine it is fully cooked. Similarly, a study completed by Prill *et al*. (2019) in the United States assessing a consumer's degree of meat doneness preferences reported that 37% consumers preferred well done beef patties to ensure food safety.

The United States Department of Agriculture (USDA) recommends the use of a thermometer to ensure pork is cooked to the microbiological temperature of 76°C (USD, 2015). In this study, visual color measurement was applied, and most respondents (29%) agreed that pork is to be cooked till rare or medium whilst only a minority (15%) indicated correctly that it is never which is correct as pork is to be well done to be consumed to ensure safety. On the contrary, a study completed by Atobla *et al*. (2018), in Obidjan District reported that cooking pork is time-bound; to determine doneness and the cooking time is between 31 minutes to 1hour. In the study, the majority of female respondents

(56%) cooked pork within stipulated time compared to males cooking pork in less than 30minutes. Furthermore, in another study compiled to assess food safety knowledge and food handling practices in cancer treatment, 77% of respondents displayed an awareness that pork meat is to be cooked till well done and in ensuring that piercing on the thickest part was done ensuring juices run clear (Evens & Redmond, 2018).

The majority of respondents (35%) incorrectly agreed that the freezing storage method kills all bacteria which is causing sickness whereas freezing results in hibernation or inactiveness for bacteria. On the contrary, a study compiled amongst mothers in Saudi Arabia assessing food safety knowledge and practice reported that 61.1% of the respondents had knowledge of food storage through refrigeration to prevent food poisoning (Ayaz, Priyarshini & Jaiswal, 2018). Another study by Evens and Redmond (2018) assessed food safety knowledge and food handling practices in the United States and reported that the majority of respondents (73%) had knowledge of refrigeration temperatures to ensure food safety. A study conducted by Guneri *et al*. (2017) in Turkey on assessing knowledge, attitude and behaviors about food safety revealed that 73.2% of respondents knew that freezing does not destroy bacteria but stops bacteria reproduction.

The majority of respondents (31%) agreed that cooled food at room temperature before refrigeration is safe, which is a motion concluded regardless of implementing cooling methods such as stirring continuously till the food is completely cooled, or movement of food to cooler storage for 2hrs in the case of perishable products, which if kept in a cooler storage for more than two hours will have to be thrown away. In Saudi Arabia, the majority of respondents (37.8%) were reported to know about cooling prepared food for 3hours before storing it in the fridge and then reheating it when ready for consumption (Atikuzzamman *et al.*, 2018). Furthermore, a study compiled in Zagazig, Egypt assessing female teachers' safe food handling reported (25%) respondents depended on leaving hot foods at room temperature for more than four hours as being a safe practice (Allah *et al*., 2017). Another study conducted by Abuga, Nyumari and Njagi (2017) in Nairobi,

Kenya assessing consumer food hygiene and safety practices reported that 40% of respondents cooked food stored at room temperature for more than two hours.

Food irradiation is the food safety tool used to reduce dangerous foodborne pathogens. In this study, 36% of respondents knew the irradiation of meat or poultry as a means to destroy foodborne microorganisms. The results of this study are similar to those of Rozekhi *et al*. (2018) conducted in Uit Penang assessing consumers' awareness of food irradiation; the majority (36.2%) knew about food irradiation and believed it preserves food and is safe to consume. In another study conducted in Brazil to assess information on acceptability and purchase intention of irradiated food, respondents were investigated on two encounters. On the first encounter, before being informed, 15% of respondents had little knowledge and willingness to purchase irradiated food and on the second encounter, after irradiation information was presented, the majority of respondents (70%) demonstrated acceptance and willingness to purchase irradiated food (Levy and Villavicencio, 2019). Similarly, in another study conducted in the United States, experts conducted interviews on irradiation amongst consumers and reported 15% of consumers considering irradiation unsafe and 64% uncertain about the safety of irradiated meat but after being provided with irradiation benefits information they later expressed willingness to purchase irradiated food products (Feng *et al*., 2019).

5.11. Hospitality managers view on the management commitment to food safety

The results in Table 2, indicate that about 33% and 25% of managers monitor staff on food safety applications and procedures on a weekly and monthly basis. It is concerning that less than 50% of the managers' monitor staff food safety application and procedures weekly as food safety should be embedded in the day-to-day operations of the foodservice of food production to ensure food safety; the foodservice organisation should have constant daily monitoring of the implementation of the food safety applications and procedures for quality assurance and prevention of the occurrence of foodborne illnesses (Nyenje & Ndip, 2013; McLinden, *et al*., 2014). All industries that handle food products, including farmers, food transportation companies, food suppliers/vendors, and

restaurateurs to name a few, are responsible to provide quality training to employees in order to properly conduct safe food-handling tasks (FDA, 2018). These a training should be enhanced by giving supportive hands-on supervisory leadership, a consistent importance message of food safety that is emphasized by management, to ensure overall food safety (Arendt, Roberts, Strohbehn, Arroyo & Meyer, 2014).

Furthermore, the majority of managers (74%) indicated that they are delegating their food safety monitoring duties to any other staff member. It is concerning that the managers delegate their food safety monitoring duties to any other staff member as this poses a risk of non-compliance to food safety since the delegated authority may not carry the accountability of the individual staff member.

About 40% of managers indicated that the health inspectors/ environmental health officers visited them twice a year and this may contribute to the non-compliance to food safety as the inspection is one of the measurement tools to ensure food safety compliance. The regulations require that the operation be inspected at least every quarter of the year (South Africa, Regulation 962 of 2012). Waters *et al*. (2013) study on perceptions of restaurant operators and managers concerning foodservice inspections revealed that inspection practices used by food inspectors during the inspections influenced the food safety practices (Waters *et al*., 2013). Thus, managers were accountable for the day-to-day restaurant business processes (BLS, 2013). Administrators safeguard customers satisfied with their eating experience and business repetition. In addition, public health examination records, aid customers to be aware of restaurants violating health codes (Kang, Kuznetsova, Choi, & Luca, 2013). Publications and reports of quality rankings given by the health department after a restaurant health inspection, influenced consumers of food prepared in restaurants. Mc Linden *et al*. (2014) reported the benefits of food inspection as a preventive measure and control of foodborne illness in line with a hygienic restaurant environment.

5.12. Hospitality managers view on the existence food safety policies and procedures

Table 3 shows the majority of managers confirmed to have written policies and procedures on receiving stock (94%), hygiene (83%), administration (98%). These written policies and procedures serve as a guide for monitoring the quality of received stock and hygiene to be followed in the organisation and thus enhances the food safety compliance by the food handlers (Murwira, Amosu, & Nemathaga, 2017). To ensure that food is prepared and served without any contamination, restaurants have to abide by specific standards, rules, and regulations to ensure the safety of their clientele. The foodservice industry is under pressure to maintain food safety standards, while ensuring efficient operations and consistently exceptional customer experience. Management foster food safety culture within their organisations, practice their own policies, and ensure compliance to safe and sanitary workplace (Griffith, Livesey, & Clayton, 2010; Nayak & Waterson, 2017; Nyarugwe, Linnemann, Hofstede, Fogliano, & Luning, 2016). This study also revealed that majority of managers (95%) confirmed to have the organisation's written policy and procedures on personal hygiene tailored for employees and all visitors. This is a good practice that can ensure that food handlers consistently and correctly implement proper measures of a policy and procedures on personal hygiene (Samapundo *et al*., 2015).

A majority (63% and 58%) of managers indicated to have not had a storage and serving policy. This is a concern since the absence of a dedicated storage facility can lead to inappropriate food storage practices and cross-contamination between foods during storage which may result in the con-compliance with the storage requirements and thus results in an inappropriate storage facility for food (Lockis *et al*., 2011; Topliceanu, Bibire, & Nistor, 2015). This may result in the contamination and compromise the quality of the food produced in the facility and create complain to customers for not meeting their requirements and food safety obligation (McLinden *et al*., 2014). The restaurants must set in place practices and procedures to keep their guests safe from harm.

In addition, the majority of managers (66%) indicated that personal hygiene policy and procedures are followed by every individual entering production or service area in an organisation which is an indication of good personal hygiene and thus enhancing food safety and preventing cross-contamination (Samapundo *et al*., 2015). Food handlers must maintain good personal hygiene to ensure food safety in food preparation. A study conducted by Harris, DiPietro, Line and Murphy (2019) found that the pre-employment screening tests of employees' internal values and beliefs on food safety and sanitation compliance, could improve the success of restaurants' compliance programs and food safety culture. However, the majority (60%; 76%) of the managers did not have the guidelines for cleaning and disinfecting surface and equipment and temperature monitoring of foodborne microorganisms. This is concerning as the cleaning and disinfecting of surface as well as temperature monitoring play a vital role in the prevention of cross-contamination and foodborne illnesses (Sibanyoni & Tabit, 2019).

On training, the majority (88%; 82%; 98%) of managers indicated that they received educational training on Hazard Analysis and Critical Control Points and as well as the food safety training certification was provided to the food handlers. It is vital that the employees receive food safety training to enhance their food handling practice and thus improving food safety and preventing foodborne illnesses. The FDA regulation requires a certified food safety monitor to oversee the operations of the foodservice establishment (Arendt *et al*., 2014). However, in South Africa it is not a requirement though the employees and owners of restaurants operated by the performance standards, various training programs in food security were available for use (Strohbehn *et al*., 2013). Gallardo-Gallardo, Nijs, Dries, and Gallo (2015), contend that organisations should be committed to talent management through increasing the knowledge and development of employees in building a life-long learning organisation. Kitchen managers who approve certification of the hygienic handling of food can improve the practices of food preparation in a safe way and improve business health. Arendt *et al*. (2014) study also contend that training in food safety influenced the key behavior of employees. As food poisoning occurs because of ignorance related to proper food handling, legal responsibilities, and negative business consequences that can be avoided (Gaungoo & Jeewon, 2013).

Food safety variables shows a small positive correlation between the overall food safety knowledge and personal hygiene [r = 0.724, n =110, p<005], microbial hazards [r = 0.815, n =110, p<005], temperature control [r = 0.612, n =110, p<005] scores of the food handlers. Similarly, the study conducted by Al-Ghazali, Al-Bulushi, Al-Subhi, Rahman, and Al-Rawahi, (2020) in Muscat, Oman found small positive correlation between the food safety knowledge and personal hygiene. Furthermore, the results indicated positive correlation between Personal Hygiene Knowledge and Knowledge on microbial hazards [r = 0.440, n =110, p<005], Knowledge on microbial hazards and Personal Hygiene Knowledge [r = 0.440, n =110, p<005], as well as Knowledge on Temperature control and microbial hazards for food safety knowledge [r = 0.300, n =110, p<005]. Similar findings from a study conducted in South Africa on on an assessment of the food safety knowledge and Attitudes of food fandlers in hospitals (Teffo & Tabit, 2017). However, a study conducted by Ncube, Kanda, Chijokwe, Mabaya, and Nyamugure (2020) found a significant positive correlation observed between food safety knowledge and attitudes (rs = 0.371, p < .05), food safety knowledge and observed food handling practices (rs = 0.242, p < 0.05), attitudes and observed food handling practices (rs = 0.229, p < .05), and attitudes and observed food safety practices (rs = 0.263, p < .05).

Limitations of the study

Potential limitations regarding the nature of this study must be acknowledge. Observations provide reliable information based on actual actions. Actual behavioral on food safety conduct in food safety establishments may invasive have greater value when assessing actual food safety practices. The sample is self-selected, and there could be inconsistencies with actual behavior due to socio-economics circumstances in which adhering to food and safety practices may be challenging. Disputes on these limitations on the results obtained are still useful as they reveal attitude, knowledge and non-compliance to food safety practices.

6. CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

The aim of the study was to investigate food safety knowledge and awareness in the hospitality industry. The analysis of data collected the following discussion, conclusion and recommendations were made. This section was based on objectives for food safety attitude, knowledge and awareness in hotels and restaurants of the uMhlathuze Municipality, KwaZulu-Natal. The study considered responses from food handlers, consumers and managers in hospitality operations. The conclusion of the study is as follows:

Objective 1: Food safety knowledge and awareness of food handlers

The food handlers had knowledge on food poisoning, food bacteria contamination, microbial contamination, cross-contamination, storage of food products, association of poultry products with Salmonella as the main food-borne pathogen. However, on food safety knowledge and awareness association, there was low to moderate food safety knowledge and awareness and poor food safety knowledge. In addition, the knowledge on microbial and food-borne diseases was low to moderate level of awareness of food safety while most of food handlers were unsure of the minimum internal cooking temperature of poultry. Therefore, food safety knowledge and awareness of food handlers was fairly good though there was a low to moderate food safety knowledge and awareness to other food handlers

Objective 2: The consumers' attitudes and awareness of food safety when purchasing ready-to-eat food

The results of this study indicated that the majority of respondents agreed to consider food safety issues when purchasing and always check the expiry date before purchasing food products as well as observing the cleanliness of the store where food is purchased for consumption. Furthermore, the consumers were able to store frozen food immediately after reaching home. Which is the good indication that the consumers' attitudes and awareness of food safety when purchasing ready-eat-food was fairly good though

consumers were not always checking storage instructions printed on the food package and not following preparation instructions printed on certain products.

Objective 3: Management's commitment to food safety

The majority of managers have written policies and procedures on receiving stock, hygiene and administration as well as organisation's written policy and procedures on personal hygiene tailored for employees and all visitors. However, some managers did not have storage and serving policy. The personal hygiene policy and procedures were followed by every individual entering production or service area in an organisation which is an indication of good personal hygiene and thus enhancing food safety and preventing cross-contamination. However, the majority managers did not have the guidelines for cleaning and disinfecting surface and equipment and temperature monitoring of foodborne microorganisms.

On training, the majority of managers received educational training on Hazard Analysis and Critical Control Points and as well as the food safety training certification was provided to the food handlers. Which is a good indication of the establishments' food safety measures to prevent food-borne illness. The decision to implement a food safety management system had been taken at the operations level and not as a result of corporate strategy since there was none.

On monitoring, few managers monitor staff on food safety applications and procedures on a weekly and monthly basis respectively and most of the food safety monitoring duties is delegated to any other staff member and the inspection by health inspectors/ environmental health officers is done twice a year.

Recommendations for further research

The growing concern and significance to ensure food safety in the hospitality industry needs continuous research. The findings of the study, along with identified lack of adequate food safety knowledge and awareness in food handlers is presented. A need exists to explore the

impact of food safety education programs and trainings in cooperated aiming to improve food safety awareness and practices in the hospitality establishments.

Recommendations for staff involved in the foodservices chain

In order to prevent unintentional food-borne diseases outbreaks caused by lack of adequate food safety attitude, knowledge and awareness. It is recommended that foodservices staff be subjected to food safety education and trainings based on on-going intervals to ensure food safety practices are adhering to. Foodservices staff is to be encouraged to practice good temperature monitoring to ensure food safety. Managers are responsible for food safety; it is also recommended that all foodservices' managers undergo basic training on food storage and services to impart knowledge to their working teams to constantly implement sound food safety systems and improve implementation and compliance.

Recommendations for improving this study

The results of this study may assist foodservices establishment to ensure compliance to food safety. It is recommended data collection tools be extended to food safety assurance bodies to gain insight on overall experiences encountered during monitoring and evaluation of food safety within foodservices establishments.

7. REFERENCES

ABADIN, U., ARENDT, S., & STRONBEHN, C. (2014). Food safety culture in Oriste foodservices: Development and validation of a measurement scale. *Journal of Foodservice Management and Education,* 8 (1), 1-10.

ABDULLAH SANI, N. & SIOW, O.N. (2014). Knowledge, attitudes and practices of food handlers on food safety in foodservice operations at the University Kebangsaan Malaysia. Food Control, (37), 210–217.

ABDULLAHI, B., MAIHA, S. & LAWAL, H. (2020). Hygiene food safety practices and sanitation in some foodservice centres in Zaria, Kanuda state & Nigeria, American. *Journal of Food Science and Technology*, 8 (5).

ABIDIN, U, ARENDT, S. & STROHBEHN, C. (2013). Exploring the culture of food safety: The role of organisational influencers in motivating employees' food handling practices. *Journal of quality assurance in hospitality and tourism*.

ADAMS, A., (2018). Food safety: The final solution for the hotel and catering industry. *British food journal*, 97, (4), 19-23.

ADESOKAN, H.K., AKINSEYE, V.O. & ADESOKAN, G.A. (2015). Food Safety Training Is Associated with Improved Knowledge and Behaviours among Foodservice Establishments Workers. *International Journal of Food Science*.

ADJEI, M.R., BAWA, S., AMOO-SAKYI, F., APPIAH, P.C., TWUM-NUAMAH, K. & AMUGI, G. (2020) Challenges of outbreak investigation in resort settings: A case of foodborne illness among hotel conference attendees in urban Ghana. Post graduate Medical Journal of Ghana

AKABANDA, F., HLORTSI, E.H. & OWUSU-KWARTENG, J.(2017) Food safety knowledge, attitudes and practices of institutional food-handlers in Ghana. BMC Public Health 17, 40. https://doi.org/10.1186/s12889-016-3986-9

AILIGAN- MANZANO, A. (2016). Competency based modules on food sanitation and safety*. International Journal of Academic Research in Business and Social Science*,3(8).

AL-GHAZALI, M., AL-BULUSHI, I., AL-SUBHI, L., RAHMAN, M.S. AND AL-RAWAHI, A.

(2020). Food Safety Knowledge and Hygienic Practices among Different Groups of Restaurants in Muscat, Oman. Hindawi International Journal of Food Science. 1-8. https://doi.org/10.1155/2020/8872981

ALLAH, A., DA, E., ABDELSALOM, A. & SHETA, S. (2017). Knowledge, attitude and practice of female teachers regarding safe food handling: Is it sufficient? An intervention study, Zag zig, Egypt. Egyptian Journal of Occupational Medicine 41(2).
ALQURASHI, N., PRIYADARSHIN, A. & JAISWAL, A. (2019). Evaluating food safety knowledge and practices among foodservice staff in all Madinah hospitals, Said Arabia.

ANGELO, K., BROWN, L., GOULD, L., HALL, A. & NISLER, A. (2016). Epidemiology of restaurant associated foodborne disease outbreaks, United States, 1998-2003. Available at: www.cambridge.org. 14 September [Accessed 9 June 2018].

ANSARI, M., KUMAR, V., SIGN, C., SHUKLA, V. & KUMAR, R. (2013). Studies on food safety management and its significance maximising the profit for food industry. *Journal of Food Safety*, 15, 20-28.

ANSARI-LARI, M., SOODBAKHSH, S. & LAKZADEH, L., (2010). Knowledge, attitudes and practices of workers on food hygienic practices in meat processing plants in Fars, Iran. *Food Control*, *21*(3), 260-263.

APPIETU, E. & AMUQUANDOH, F. (2020). Examining food safety knowledge and microbiological quality of school meals in Ghana. *African Journal of Hospitality and Tourism.*

ARENDT, ROBERTS, STROHBEHN, ARROYO, & MEYER, (2014)

ARENDT, S., PAEZ, P. & STROHLELM (2013). Food safety practices and manager's perceptions: A qualitative study in hospitality. *Journal of contemporary hospitality management,* 24,24.

ARENDT, S., RAJAGOPAL, L., STROHBEHN, C., STOKES, N. & MAYER, J. (2013). Reporting of foodborne illnesses by US, Consumers and Healthcare professionals. *International Journal of Environment research and public health*, 10,3684-3714.

ARENDT, S., ROBERT, K., STROHBEHN, C., PAEZ, P., & ELLIS, J. (2014). Motivating foodservice employees to follow safe handling practices: Perspectives from multigenerational workforce. *Taylor and Francis in Journal Human resources in Hospitality and Tourism,*1.

ATIKUZZAMMAN, M., ISLAM, M., MONIRUZZAMAN, M., & ISLAM. M. (2018). Vendors and consumer's status and microbiological analysis of some common fast food items of different fast-food restaurants in Barisal City. *Malaysian Journal of Halaal Research*.

ATUL SHEEL (2017). 2016–2017 Restaurant Industry Performance and the JHFM Index, The Journal of Hospitality Financial Management, 25:1, 1-3, DOI: 10.1080/10913211.2017.1330519. Available from: http://www.who.int/mediacentre/ news/releases/2015/. [Accessed: 09 June 208].

AYAZ, W., PRIYADARSHINI, A. & AIWAL, A. (2018). Food safety knowledge and practices among Said Mothers. *Food Journal,* 7*.*

AZANAW, J., GEBREHIWOT. M. & DAGNE, H. (2019). Factors associated with food safety practices among food handlers: Facility–based cross sectional study. Available at http: //creativecommons.org. [Accessed on 09 June 2018].

BASER, F., TURE, H., ABUBAKIZOZA, A., SANLIER, N. & CIL, B. (2016). Structural modelling of the relationship among food safety knowledge, attitude and behaviour of hotel staff in Turkey. Available at: www.elsevier.com. 22 August [Accessed 9 June 2018].

BISBINI, P., LEONI, E., & NANETTI, A. (2000). An outbreak of Salmonella Hader associated with roast rabbit in a restaurant. European Journal of Epidemiology, 16, 613618.

BISHOLO, K., GHUMAN, S. & HAFFEJEE, F. (2018). Foodborne disease prevalence in rural villages in the Eastern Cape, *South Africa, African Journal of Primary Health Care and Family Medicine.*

BROWN, L., HOOVER, E., SELMAN, L., & ROGERS, H. (2017). Outbreak characteristics associated with identification factors to foodborne outbreaks Foodborne pathogens and disease.

BUREAU OF LABOUR STATISTICS (2012). Handbook of methods, chapter 9:

Occupation safety and Health statistics. Washington DC: US Department of Labour.

BUREAU OF LABOUR STATISTICS (2013). BLS report details of occupational injuries illnesses resulting in job or restriction work. Washington DC: US Department of Labour.

BURKE, T., YOUNG, I. & PAPADOPOULOS, A. (2016). Assessing food safety knowledge and preferred information sources among 19–29-year-olds. *Food Control*, *69*, pp.83-89.

CALCADOR, C.J. (2017). Restaurant management strategies to comply with food safety regulations, Walden University, Dissertation.

CASINGENA, J. (2016). Food safety management in catering establishment in Malta. United Kingdom: University of Reading, Faculty of Hospitality.

CENTRES FOR DISEASE CONTROL & PREVENTION. (CDC). (2014). Incidents and trends of infection with pathogens transmitted commonly through food. Foodborne diseases active surveillance network, United States. Available at: www.cdc.gov. [Accessed 9 June 2018].

CHELLAIYAN, V., FASNA, J., SADHU, L. & MALIK, A. (2018). Exploring food handler's attitudes towards food safety in hospitality industry, *Egyptian Journal of Tourism Studies,* 15(2).

CODEX ALIMENTARIUS: Understanding Codex: FOA and WHO (2012). Available at: www.codexalimentarious.org. 6 September [Accessed 9 June 2018].

COMMUNICABLE DISEASES COMMUNIQUE (2017). Enteric diseases: District and

Provincial diseases,16, (8).1-2.

DARKO, S., ROBERTSON, F.& MANU, F. (2015). Evaluation of some hotel kitchen staff on their knowledge on food safety and kitchen hygiene in the Kumasi metropolis. *International Food Research Journal*,22, (6), 2664-2669.

DEHGHAN, P., POURNAGHI-AZAR, F., AZAMI-AGHDASH, S., SAHRABY-SILABI, Y., DADKHAN, H & MOHAMMEDZADEN-AGHDAH, H. (2017). Knowledge and attitude towards health and food safety among students of Tabriz University of medical sciences. *Tabriz, Iran Journal, Clinical and medical* 5, (2).

DEPARTMENT OF AGRICULTURE FOOD SAFETY AND INSPECTION SERVICE.

(2015). Safe Minimum Internal Temperature Chart Available online

htttp://www.fsis.usdagov/wps/portal/fsis/topics/food-safety-education/get answers/foodsafety-fact-sheets/safe food handling/safe-minimum-internal-temperature-chart/ct-index.

[Accessed on 06 November 2020].

DEPARTMENT OF HEALTH (DOH). (2018). Listeriotic outbreak situation report– 18/06/2018. Available at www.health.gov.za. [Accessed on 05 May 2020).

DEPARTMENT OF HEALTH. REPUBLIC OF SOUTH AFRICA. (2004). Policy

guidelines: National food safety alerts and official food product recalls in South Africa.

DEPARTMENT OF HEALTH. REPUBLIC OF SOUTH AFRICA. (2010). *Policy for Foodservice Management in Public Establishment*. 13 - 14.

DEPARTMENT OF HEALTH: (RSA) (2004). Policy guidelines: National food safety alerts and official food products recall. South Africa.

DUNDES, L. & SWANN, T. (2008). Food Safety in Fast Food Restaurants, Journal of

Human Resources in Hospitality & Tourism, 7:2, 153-161, DOI:10.1080/15332840802156881.

DZWOLAK, W. (2016) Practical Aspects of Traceability in Small Food Businesses with Implemented Food Safety Management Systems. Journal of food safety, 36, 2: 203213.

EMPLOYMENT CONDITIONS COMMISIONS (2016). Commission Report on the investigation to Hospitality Sector. Government Gazette. No 39621.

ERCAN ORUC, D., POKHAREL, S., ANANTHESWARAN, R.C., BUCKNAVAGE, M.W., GOURAMA, H., SHANINA, O. & CUTTER, C.N., (2020). A comprehensive food safety short course (FSSC) improves food safety knowledge, behaviours, attitudes, and skills of Ukrainian participants. *Journal of Food Science Education*, *19*(4), 263-277.

EZEUDUJIA, I.O., CHIBE, M.E. AND NYATHELA, T. (2017) Hospitality management study program and students 'perceptions: universities in South Africa. Journal of Teaching in Travel & Tourism, 17(4), 313–324

FALUKE, A. (2015). Access to safe food in South Africa as a human right imperative.

Western Cape: University of Western Cape, Faculty of law Library.

FELTES, M., BRAGOTTO.A. & BLOCK, J. (2016). Food quality foodborne diseases and food safety in the Brazilian food industry, *Food quality and Safety Journal.*

FENG, Y., RAMAS, T, SHANKAN, S. & BRUHN, C. (2019). Meat irradiation technology usage: Challenges and recommendation from expert interviews. Food Preparation Trends 39(1).

FIELDING, L., ELLIS, L., CLAYTON, D., & PETERS, A. (2011). An evaluation of process specific information resources, aimed at hazard analysis in Small and Medium Enterprises in food manufacturing. Food Control, 22, 1171-1177.

FLETCHER, S.M., MAHARAJ, S.R., & JAMES, K. (2009). Description of the food safety system in hotels and how it compares with HACCP standards, *Journal of Travel Medicine,* 16: 35–41. DOI:10.1111/j.17088305.2008. 00271.xFood Safety Magazine Edigest, 2018.

FOODSTUFFS, COSMETICS AND DISINFECTANT ACT OF 1972 (2015). Regulations governing general hygiene requirements for food premises, transport and food-related matters. Available at: www.gpwonline.co.za. [Accessed 9 June 2018]. GNR. 908: Regulations relating to the application of the Hazard Analysis and Critical.

GADELRAB, R. & HUSSEIN, M. (2016). Exploring food handler's attitude towards food safety in the hospitality industry, Egyptian Journal of Tourism Studies, 15 (2).

GAIBANI, P., AMBRETTI, S., BERLINGERI, A., CORDOVANA, M.,

FARRUGGIA, P., PANICO, M., LANDINI, M.P. & SAMBRI, V., (2011). Outbreak of

NDM-1-producing Enterobacteriaceae in northern Italy, July to August 2011. *Eurosurveillance*, *16*(47), 20-027.

GALLARDO-GALLARDO, E., NIJS, S., DRIES, N., & GALLO, P. (2015). Towards an understanding of talent management as a phenomenon-driven field using bibliometric and content analysis. Human Resource Management Review, 25, 3, 264-279.

GAUNGOO, Y., & JEEWON, R. (2013). Effectiveness of training among food handlers: A review on the Mauritian Framework. Current Research in Nutrition and Food Science, 1,1, 01-09.

GHEZZI, S. & AYOUN, B. (2018). Food safety in the USA catering industry: empirical findings. Internal journal of contemporary hospitality management, Vol. 25, pp.365-382.

GIRAUDON, I., CATHCARTC, S., BLOMGVISTC, S. LITTLETOND, A. SURMAN-LEEE, S., MIFSUDF, A., ANARAKIC, S. & FRASERA, G. (2009). Large outbreak of salmonella phage type 1 infection with high infection rate and severe illness associated with fast food premises. Public Health, 123, (6), 444-447.

GOURAMA, H., SHANINA, O., & CUTTER, C. (2020). A comprehensive food safety short course (FSSC) improves food safety knowledge behaviours, attitude and skills of Ukrainian participants*, Journal of Food Science*, 19.

GRAFFITH, C., JACKSON, L. & LEUS, R. (2016). The food safety culture in a large

South African foodservice complex: Perspective on a case study, *British Food Journal,*119(4).

GREEN, L., SELMAN, C., BANERJEE, A., MARCUS, R., MEDUS, C., ANGULO, F.J., RADKE, V., BUCHANAN, S. & EHS-Net Working Group, 2005. Foodservice workers'

self-reported food preparation practices: an EHS-Net study. *International Journal of Hygiene and Environmental Health*, 208(1-2), 27-35.

GREEN. E. & KNECHTGE, S. (2016). Food safety knowledge and practices of young adults, *Journal of Environment Health*, 77 (10).

GRIFFITH, C. (2000). Competition in the food marketing chain. The Australian *Journal of Agricultural and Resource Economics*, 44: 333-367.

GRIFFITH, C.J., JACKSON, L & LUES, R. (2016) The food safety culture in a large South African foodservice complex: Perspective on a case study. *British food journal*,119, 4.

GRIFFITH, C.J., LIVESEY, K.M. & CLAYTON, D.A. (2010). Food safety culture: the evolution of an emerging risk factor? *British Food Journal*, 112, (4) 426-438. https://doi.org/10.1108/00070701011034439.

GRINNELL, JR. RM. & UNRAU, YA. (2008). *Social work research and evaluation*:

Foundation of evidence-based practice. New York: Oxford University Press.

GURSOYARD, D. & SANDSTROM, J. (2016). An updated ranking of hospitality and tourism journals. *Journal of hospitality and tourism research*,40, (1) 1-18.

GURSOY, D. (2019) “Foodborne Illnesses: An Overview of Hospitality Operations Liability”, *Journal of Hospitality*, 1(1), pp. 41-49. available at: http://htmjournals.com/jh/index.php/jh/article/view/6 (accessed: 3june2022).

HARRIS, K., ALI, F & RYU, K (2017). *International journal of contemporary hospitality management.* Available at: www.emeraldinsight.com. 7 February [Accessed 9 June 2018]. Investigation and control. France.

HARRIS, K.J., DIPIETRO, R.B., LINE N.D & MURPHY, K.S. (2019). Restaurant employees and food safety compliance: motivation comes from within, *Journal of Foodservice Business Research*, 22:1, 98-115, DOI:10.1080/15378020.2018.1547037.

HARRIS, K.J., MURPHY, K.S., DEPIETRO, R.B. & RIVERA, G.L., (2015). Food safety

inspections results: A comparison of ethnic-operated restaurants to non-ethnic-operated restaurants. *International Journal of Hospitality Management*, *46*, 190-199.

HEDBERG, C. (2013). Explaining the risk of food-borne illnesses associated with restaurants: the environmental health specialists network. *Journal of food protection,* 76, (12).2124-2125.

HEDBERG, C.W., SMITH, S.J., KIRKLAND, E., RADKE, V., JONES, T.F., SELMAN, C.A. & EHS-NET Working Group, (2006). Systematic environmental evaluations to identify food safety differences between outbreak and no outbreak restaurants. *Journal of Food Protection*, *69*(11), 2697-2702.

HUSSEIN, M. & GADEELRAL, R. (2017). Exploring food handler's attitude towards food safety in the hospitality industry, *Egyptian Journal of Tourism Studies,*15 (2).

INSULANDER, M., DE JONG, B., & SVENUNGSSON, B. (2008). A food-borne outbreak of cryptosporidiosis among guests and staff at a hotel restaurant in Stockholm county, Sweden, September 2008. Euro surveillance, 13(51), 1-2.

JACKSON, T. (2011). August. Societal transformations for a sustainable economy.

In *Natural Resources Forum*,35, (3), 155-164). Oxford, UK: Blackwell Publishing Ltd.

JASMINE, V., LAGANATHAN, L & MALLIKA, S. (2018). Food safety awareness and food handling practices among rural population of Tamil Nadu, *International Journal of Community Medicine*.

KANG, J. S., KUZNETSOVA, P., LUCA, M., & CHOI, Y. (2013). Where Not to Eat?

Improving Public Policy by Predicting Hygiene Inspections Using Online Reviews. In

Proceedings of the 2013 Conference on Empirical Methods in Natural Language Processing, 1443–1448.

KAPAYA, F., MWANSA, F., SAKUBITA, P., GAMA, A., LANGA, N., CHEWE, O MUTALE,

L., NANZALUKA, F., GERSHOM, C., CHOLA, M., KAPATA, N., SINYANGE, N.

CHIBUYE, S. & YARD, A. (2017). A foodborne disease outbreak investigation experience in a College in Lusaka, Zambia. *The Pan African Medical Journal*, 2018; (29),100.

KARADAL, F., KUM, E & AKCAY, A. (2020). Knowledge and attitude of food safety and the occurrence of indicator bacteria on hands of food handlers at the port of Pastrami Sale.

KILLIC, O., & ERYILMAZ, G. (2018). Factors affecting consumer's awareness of food safety. *Agro Food Industry Hi-Tech journal, 26 (3).*

KUMARI, V. & KAPUR, D. (2018). Evaluating compliance of food safety and hygiene standards in selected Delhi-based catering establishments as per schedule iv of food safety and standards Regulation,2011 under FSS Act 2003, Science and Technology Journal, 14(11).

LAMID, R. (2016). Knowledge and practices of food safety among senior secondary school students of Ambassadors College, Ile-Ife, Nigeria. *South American Journal of Public Health*.4 (1).

LEVY, D. & VILLAVICENCIO, L. (2019). Food irradiation communication strategies to bridge the gap between scientist and public. (2019). International Nuclear Atlantic Conference.

LOCKIS, V. R., CRUZ, A. G., WALTER, E.H.M., FARIA, J. A., GRANATO, D., & SANT'ANA, A. S. (2011). Prerequisite programs at schools: Diagnosis and economic evaluation. Foodborne Pathogens and Diseases, 8(2), 213–220. doi:10.1089/ fpd.2010.0645

LOW, W., FRANCO, W., HSU, W., MARSHAL, M., & SIMONNE, A. (2016). A historical look at the prevalence of foodborne disease outbreaks associated with Asian food in the United States. Food Protection Trends 36 (2).

LUND, T., KJAERNES, U. & HOLM, L. (2017). Eating out of four Nordic countries: National patterns and social stratification. Available at: www.elsevier.com. 18 June [Accessed 9 June 2018].

MADHWAL, S., & SHARMA, S. (2019). Food safety and procumbent practices in relation to foodborne disease incidence in Ludhaiana District, India. *International Journal of Current Microbiology and Applied Sciences,* 8 (10).

MADUNA, T. & ENSOR, C. (2015). The African traveller, hospitality outlook: 2015-2019, South Africa, Nigeria, Mauritius & Kenya. 5th ed. South Africa: Prince water house coopers.

MANNING, L. & SOON, J. (2016). Food safety, food fraud and defence: A fast evolving literature. *Journal of Food Science*,81, (4).

MANNING, L. (2018). The value of food safety culture to the hospitality industry, Worldwide hospitality and tourism, 19, (3), pp.284-295.

MAREE, K. (2016). First step in research.2nd ed. Pretoria: Van Schaik Publishers.

MARINAKOU, E. 2014. Women in Hotel Management and Leadership: Diamond or Glass? *Journal of Tourism and Hospitality Management*, 2(1), 18-25.

MATHEUS, A., FRANCO, W, HSU, W, MARSHALL, M. & SIMONNE, A. (2016). A historical look at the prevalence of food-borne diseases outbreaks associated with Asian foods in the United States. Food Protection Trends, vol. 36, (2), 108-110.

MCINTYRE, L., VALLASTER, L., WILCOTT, L., HENDERSON, S.B. & KOSATSKY, T. (2013). Evaluation of food safety knowledge, attitudes and self-reported handwashing practices in FOODSAFE trained and untrained food handlers in British Columbia, Canada. *Food Control*, 30: 150 – 156.

MCLINDEN, T., SARGEANT, J. M., THOMAS, M. K., PAPADOPOULOS, A., and FAZIL, A. (2014). Component costs of foodborne illness: A scoping review. BMC Public Health, 14, 509. doi:10.1186/1471-2458-14-509.

MELDRUM, R. C., YOUNG, J. T. N., & WEERMAN, F. M. (2009). Reconsidering the effect of self-control and delinquent peers: Implications of measurement for theoretical significance. *Journal of Research in Crime & Delinquency,* 46, 353-376.

MGQIBANDABA, P., MODILO, F., DU-PREEZE, C., MKOKA, J. and UNATHI, K. (2019). Evaluating food, safety and hygiene knowledge and practices among foodservice staff on feeding scheme in primary schools in Soweto, South African *Journal of Food Safety.*

MJOKA, J. & SELEPE, M. (2018). Food hygiene practices and attitudes of the street food vendors at Dlangezwa, North KwaZulu-Natal, *Journal of Hospitality, Tourism & Leisure*,6 (3).

MOFFAT, C., MUSTO, J., PINGAIULT, N., MULLER, M., STAFFORD, R., GREGORY, J., POLKINGHORNE, B. & KIRK, M. (2016). Salmonella typhimurium and outbreaks of egg associated diseases in Austria, 2001-2011, 10(4),1-7.

MOHAYDIN, G., CHAO, A., ARIZ, B, BASHIR, M & IRFAN, J. (2017). Effect of food quality on consumer perceived satisfaction level and mediating effect of food safety. *International Journal of New Technology and Research*,3, (1), 34-41.

MOREB, N, PRIYADARSHIN, A. & JAISWAL, A. (2017). Knowledge of food safety and food handling practices among food handlers in the Republic of Ireland, *Food Control*.

MOY, F, ALLIAS, A & JANI, R. (2018). Determinants of self-reported food safety practices among youth: Cross-sectional online study in Kuala Lumpur, Malaysia. *British Food Journal* 120(4*).*

MURWIRA, T.S., AMOSU, A.M. & NEMATHAGA, L.H. (2017). The Level of Compliance of Food Handlers with National Regulations on Food Hygiene and Safety Practices: A Case of Selected Fast Food Outlets in Thohoyandou, South Africa, *Universal Journal of Public Health,* 5(3): 85-92.

NARTELY, E., GAMOR, J., & MENSAH, E. (2017). Assessment of knowledge and practices of food hygiene and safety of caterers in senior high schools in Ghana: A case study of two senior high schools in Koforidua, *ADRIRI Journal of Agriculture and Food Science,* 3(3).

NAYAK, R. & WATERSON, P. (2017). The Assessment of Food Safety Culture: An investigation of current challenges, barriers and future opportunities within the food industry, *Food Control*, 73, 1114-1123

NCUBE F, KANDA A, CHIJOKWE M, MABAYA G, NYAMUGURE T. 2020. Food safety knowledge, attitudes and practices of restaurant food handlers in a lower-middle income country. Food Science and Nutrition. 8:1677–1687. https ://doi.org/10.1002/fsn3.1454

NDWANDWE, S.B. & WENG, R.C. (2017). Pork consumer's preferences in Swaziland. *International Journal of Development and Sustainability*.6(2).

NYARUGWE, S.P., LINNEMANN, A., HOFSTEDE, G.J., FOGLIANO, V. & LUNING, P.A. (2016). Determinants for conducting food safety culture research. *Trends in Food Science & Technology*, *56*, pp.77-87.

NYENJE, M. E., & NDIP, R. N. (2013). The challenges of foodborne pathogens and antimicrobial chemotherapy: *A global perspective. African Journal of Microbiology Research*, 7(14), 1158–1172. doi:10.5897/AJMRx12.014.

ODEBOWALE, O. (2017). Food safety and health: A survey of rural and urban household consumer practices, knowledge of food safety and food-related illness in Ogun State. Epidemiology Biostatistics and Public Health 14(3).

ODONKOR, S & ODONKOR, C. (2020). An assessment of food safety knowledge and practices in the Ghanaian hospitality industry, *Journal of Food Quality,* 2020.

OLIVEIRA, M., VIÑAS, I., COLÀS, P., ANGUERA, M., USALL, J. & ABADIAS, M. (2014). Effectiveness of a bacteriophage in reducing Listeria monocytogenes on freshcut fruits and fruit juices. *Food Microbiology*, *38*,137-142.

OLOGBON, O.A.C., AMOKAYE, V.O., ADERANTI, A., YANGOMODOU, O.D.,

OLOGBON, K.T. & OLUGBEMI, M.T. (2019). Quality and Safety Awareness of ReadyTo-Eat Foods among Rural Households in Yewa Communities of Ogun State, Nigeria,

15, (7).

ONDOKOR, S., KURANTIN, N. & SALLAR, A. (2020). Food safety practices among postnatal mothers in Western Ghana, *African Journal of Hospitality and Tourism Management,* 2, (1).

ONYENEHO, S. & HEDENBERG, C. (2013). An assessment of food safety needs of restaurants in Owerri, Imo State, Nigeria. *International journal of environmental research and public health,* 10, 3296- 3309.

ONYONGO, D. & CHALOTTE-MAPELU, I. (2019). Assessment of food handler's knowledge of food safety management in selected star rated hotels in Edoret town, Kenya, *International Journal of Multi-Disciplinary Research*,5 (4).

PANCHAL, P., BONHOTE, P. & DWORKIN, M. (2016). Food safety and knowledge among restaurant food handlers in Neuchatel Switzerland, Food Protection Trends,33 (3).

PANNINGTON, S., HEUILIER, K., MORRIS, C. & MILLMAN, C. (2019). E. Coli with aside of fries? The real safety risk increasing trend for pink burghers in the UK.

PETZER, D. & MACKAY, N. (2014). Dining atmospherics and foodservice quality as predictors of customer satisfaction at sit-down restaurants. African Journal of Hospitality*, Tourism and Leisure,* 13, (2),1-14.

PICHLER, J., ZIEGLER, J., ALDRIAN, U., & ALLERBERGER, F. (2014) Evaluating levels of knowledge on food safety among food handlers from restaurants and various catering businesses in Vienna, Austria 2011/2012. *Food Control*, 35, 33-40.

POLICY ON RESEARCH ETHICS (2013). Available at: www.unisa.ac.za. 20 September [Accessed 27 September 2018].

PURNOMO, H. (2014). Food safety in the hospitality industry. Journal *Management per Hotel and Hotel*, 2, (1),1-6.

REBOUCUS, L., SANTIAGO, L., MARTINS, L., MANEZES, A., ARAUJO, M. & ALMEIDA, R. (2016). Food safety knowledge and practices of food handlers, head chefs and managers in hotels, restaurants of Salvador, Brazil, 17.

Regulations relating to the application of the hazard analysis and critical control point system (HACCP system). 2003. No 25123 (No. R. 908). *Foodstuffs, Cosmetics and Disinfectants Act*. 1972 (Act No 54 of 1072). Regulation Gazette N0. 7696. Vol. 456. Pretoria. June 27.

ROBERTS, K., ARENDT, S., STROHBEHN, C., ELLIS, J., & PAEZ, P. (2013). Educating future managers to motivate employees to follow food safety practices. *Journal of Foodservice Management and Education*, 6, (1), 1-8.

ROGERSON, C, M. (2013). Urban tourism, economic regeneration and inclusion Evidence from South Africa. Available at : www.sagepublications.com [Accessed 5 December 2018].

ROTICH, D., BURUG, R. & CHALIMO, D. (2017). Food safety risk factors in selected outside catering enterprise in Nairobi, Kenya, *Journal of Research and Innovation*. 5 (4).

ROZEKHI, H., HUSSIN, S., SIDDIQE, A., BASIR, M. & MAJID, H (2018). Consumer's understanding and awareness of food irradiation in Uit Penang. *Journal of Academia Uit Nigeria Sembilan* 6, (1).

SAMAPUNDO, S., CLIMAT, R., XHAFENI, F., & DEVLIEGHERE, F. (2015). Food safety knowledge, attitudes and practices of street food vendors and consumers in Portau-Prince, Haiti. *Food Control*, 50, 457–466. doi: 10.1016/j.foodcont.2014.09.010.

SANI, N.A. & SIOW, O.N. (2014). Knowledge, attitudes and practices of food handlers on food safety in foodservice operations at the University Kebangsaan Malaysia. *Food Control*, (37)210-217.

SHOJAEI, H., SHOOSHTARIPOOR, J. & AMIRI, M., (2006). Efficacy of simple handwashing in reduction of microbial hand contamination of Iranian food handlers. *Food Research International*, *39*(5),.525-529.

SHOJAEI, M.G., GUTOW, L., DANNHEIM, J., RACHOR, E., SCHR¨ODER, A., &

BREY, T., (2016). Common trends in German Bight benthic macrofaunal communities: assessing temporal variability and the relative importance of environmental variables. J.

Sea Res. 107, 25–33.

SHONHIWA, A, NTSOE, G., ESSEL, V., THOMAS, J, & MC CARTHY, K. (2017). Review of food borne diseases outbreaks reported to the outbreak response unit, National institute for communicable diseases SA, 2013-2017, 16, (1).

SHONHIWA, A.M., NTSHOE, G., ESSEL, V., THOMAS, J. & MCCARTHY, K., (2019). A review of foodborne disease outbreaks reported to the outbreak response unit, national institute for communicable diseases, South Africa, 2013–2017. *International Journal of Infectious Diseases*, *79*, 73.

SIBANYONI, J. J., & TABIT, F. T. (2019). An assessment of the hygiene status and incidence of foodborne pathogens on food contact surfaces in the food preparation facilities of schools. Food Control, 98, 94 –99.

SIBANYONI, J.J., TSABALALA, P.A., & TABIT, F.T. (2017). Food safety knowledge and awareness in food handlers in school feeding programs in Mpumalanga, South Africa, Food Control,73.

STATISTICS SOUTH AFRICA (STATS SA). (2018). General Household General Household.

STATISTICS SOUTH AFRICA, (2017). Living Conditions of households in South Africa:

An analysis of household expenditure and income data using LCS 2014/2015.

STRATEV, D. ODEYEMI, O.A., PAVLOV, A., & BAMIDELE, F.A. (2017). Food safety knowledge and hygiene practices among veterinary medicine students at Trakia University, Bulgaria. Journal of Infection in Public Health, 10(6):778-782.

STROHBEHN, C., ARENDT, S., ABIDIN, U., & MEYER, J. (2013). Effectiveness of food safety managerial training: Face to face or Computer-based delivery. *Journal of Foodservice Management and Beverage Management*,17, (1,)7-19.

TEFFO, L.A. & TABIT, F.T. (2020). An assessment of the food safety knowledge and attitudes of food handlers in hospitals. *BMC Public Health*, *20*(1), 1-12.

TEGEGNE, H.A. & PHYO, H.W.W., (2017). Food safety knowledge, attitude and practices of meat handler in abattoir and retail meat shops of Jigjiga Town, Ethiopia. *Journal of Preventive Medicine and Hygiene*, *58*(4), p. E320.

TOPLICEANU, L., BIBIRE, L. & NISTOR, D. (2015). Professional competences of the personnel working on quality control and food safety in the food industry. ProcediaSocial and Behavioural Sciences, 180, 1030–1037. doi: 10.1016/j.sbspro.2015.02.198.

TUNCER, T. & AKOGLU, A. (2020). Food safety knowledge and food handlers working in hotel kitchens in Turkey. Food and Health,16(2).

WALKER, E., PRITCHARD, C., & FORSYTHE, S. (2003) Food handlers' hygiene knowledge in small food businesses. *Food Control*,14, (5), 339-343.

WATERS, A. B., VANDERSLICE, J., PORUCZNIK, C. A., KIM, J., DELEGGE, R., & DURRANT, L. (2013). Impact of internet posting of restaurant inspection scores on critical violations. *Journal of Environmental Health,* 10(8).

WEBB, M. & MORANCIE, M. (2015). Food safety knowledge of foodservice workers at a university campus by education level, experience, and food safety training. *Food Control*,50: 259 – 264.

WORLD HEALTH ORGANISATION. (WHO) (1984). The role of food safety in health and development: report of a Joint FAO/WHO Expert Committee on Food Safety [meeting held in Geneva from 30 May to 6 June 1983. [Accessed 20/June/2018].

WORLD HEALTH ORGANISATION (WHO) (2008). Food safety issues: Terrorist threats to food. Switzerland. Available at: www.who.int/foodsafety. [Accessed 20/June/2018].

WORLD HEALTH ORGANISATION (2015). Non communicable diseases, fact sheet.

Available at: www.who.int/media centre/factsheet. [Accessed 27 September 2018].

World Health Organisation (WHO). (2015). WHO estimates of the global burden of foodborne diseases: foodborne disease burden epidemiology reference group 2007-2015. Available at

www.who.int/foodsafety.https://apps.who.int/iris/bitstream/handle/10665/199350/9789241565165 [Accessed 20/June/2018].

WORLD HEALTH ORGANISATION (WHO). (2012). WHO Initiative to estimate the global burden of Foodborne Diseases. Increasing impact through collaboration. Foodborne Disease Stakeholder Meeting, 20 November 2008,

Geneva.Availablehttp://www.who.int/foodsafety/publications/foodborne_disease/FERG_Nov07.pdf. [Accessed on 08 June 2018].

WORLD HEALTH ORGANISATION. (2017). WHO's first ever global estimates of foodborne diseases find children under 5 account for almost one third of deaths. [Accessed on 08 June 2018].

YAPP, C. & FAIRMAN, R. (2006). Factors affecting food safety compliance within small and medium-sized enterprises: Implications for regulatory and enforcement strategies. *Food Control*, 17(1),42-51.

YILDIRIM, Y., ONMAZ, N.E., GÖNÜLALAN, Z., HIZLISOY, H., SERHAT, A.L., KARADAL, F., ERHAN, K.U.M. & AKCAY, A., (2020). Knowledge and attitudes in food safety and the occurrence of indicator bacteria on the hands of food handlers at the point of pastrami sale. *Ankara Üniversitesi Veteriner Fakültesi Dergisi*, *67*(2),153-160.

ZEESHAN, M, SHAN, H., DURRANI, Y., AYBUN, M., JAN, Z and SHAN, M. (2017). A questionnaire, based survey on food safety knowledge during food, handling and food preparations practices among university students. *Journal of Clinical Nutrition and Dietetics*.

ZHONG, Y., WU, L., CHEN, X., HANG, Z & HU, W. (2018). Effect of food additive information on consumer's willingness to accept food with additives. *International Journal of Environmental Research and Public Health.*

ZULFAN, M. & AHMAD, A. (2019). The management of catering services: The environmental insight in the Medan city, Journal in Economics, Business & Management, 111.

APPENDIX 1: QUESTIONNAIRE OF FOOD SAFETY KNOWLEDGE AND AWARENESS IN THE HOSPITALITY INDUSTRY

SECTION 1: DEMOGRAPHIC CHARACTERISTICS (TO ANSWERED BY ALL PARTICIPANTS)

Code of the hospitality facility: _____

The questions aim to investigate the attitude, knowledge and food safety awareness of food handlers and consumers in a hospitality Industry. Answer or a Yes or No or any one of the choices you have been given. You have a choice to make comments at the end of the questions. Write the answer to questions by placing a cross (X) in the box or filling in the relevant information.

Please tick the appropriate response for each question.

1.1 What is your gender?

1	Male
2	Female

1.2 What is your age?

1	Under 25 years
2	25-35 years
3	36-45 years
4	46-55 years
5	56-65 years
6	Over 65 years of age

1.3 Which of the following best describes your level of qualification?

1	Less than high school
2	Vocational certificate
3	Skills certificate
4	University of Technology Diploma
5	University degree
6	Post graduate degree

1.4 Years of experience in Foodservice Unit

1	Less than 5 years
2	5 – 10 years
3	10 – 15 years
4	15 0 20 years
5	20 – 25 years
6	Above 25 years
7	Not applicable

1.5 Do you have previous experience in foodservice before current position?

1	Yes
2	No
3	No applicable

1.6 Which one below represents your work activity?

1	Food handler/ Cook
2	Scullery
3	Cleaner
4	Supervisor
5	Other (specify)
6	Not applicable

1.7 Have you attended a training course on food safety?

1	Yes
2	No

1.8 Is your establishment utilizing a HACCP program/monitoring system in your foodservice unit?

1	Yes
2	No
3	Not applicable

1.9 Does your facility have designated food safety assurance person?

1	Yes
2	No
3	Don’t know
4	Not applicable

1.9 Are there enough cleaning tools to clean the kitchen e.g. broom, mop, cloths, sponge?

1	Yes
2	No
3	Not applicable

SECTION 2: KNOWLEDGE ON PERSONAL HYGIENE (*To be completed by only food handlers from section 2 to section 4)*

The questions below are about knowledge on personal hygiene, please answer by ticking the appropriate answer.

2.1 In order for your clothing not to contaminate food, you need to……

Store personal belongings and clothing in food storage areas at the corner.	1
Change in the toilet.	2
Store personal belongings and clothing in a locker or changing room.	***3***
All of the above	4

2.2 If a food handler is sick with bad cold, fever and diarrhoea, he/she should……

Wash hands before work	1
Take medicine before going to work.	2
Take adequate rest at home.	3
Not handle food until he receives medical clearance	***4***

2.3 To wash the hands we can use……..

Bleach	1
Detergent	***2***
Pine gel	3
None of the above	4

2.4 Which of the following symptoms make the food handler refrains from work place?

Vomiting	1
Fever	2
Diarrhoea	3
All of the above	***4***

2.5 If you have a cut on your hand, you must……..

Stay at home	1
Continue working and hope that bleeding stops	2
Stop the bleeding, cover it with bandage and wear non-latex gloves	***3***
Keep your hand elevated to stop bleeding	4

2.6 Hand washing should be done……

Before handling food	1
After handling food	2
In between preparations	3
All of the above	***4***

2.7 Which one step do you follow for washing hands?

Rinse, wash, sanitize and air dry	1
Sanitize, wash, rinse, pre-scrape and towel dry	2
Wash, rinse, towel dry and sanitize	***3***
Wet hands, apply soap, scrub, rinse and air dry or paper towel	4

2.8 For drying hands after washing, one must…….

Use a cotton wool	1
Just shake excess water away	2
Use an air dryer	3

Use a paper towel	***4***

2.9 Hands must be dried after washing in order to……

A. Prevent dripping of water	1
B. Prevent germs and bacteria which get spread with wet hands	2
C Hold the utensils properly	3
D. a and b	***4***

2.10 Which of the following jewellery is acceptable for you to wear in food preparation area?

Watch	1
Arm ring	2
Bracelet	3
None of the above	***4***

SECTION 3: KNOWLEDGE ON MICROBIAL HAZARDS AND FOOD BORNE DISEASES

3.1 What are the signs and symptoms of food poisoning?

Vomiting, Nausea	1
Stomachache	2
Diarrhoea	3
All of the above	***4***

3.2 Food borne infections occur when people eat…….

Poisons food	1
Spicy food	2
Cold foods	3
Contaminated food	***4***

3.3 Which of the following is true about the bacteria?

Bacteria multiply and grow faster in warm environments	***1***
Bacteria need air to survive	2
All types of bacteria lead to poisoning	3
Freezing prevents transmission and multiplication of bacteria	4

3.4 Which of the following is important to prevent food poisoning?

Thoroughly wash and dry hands	1
Never cough or sneeze over food or where food is prepared or stored	2
Covering and tying hair.	3
All of the above	***4***

3.5 Risks for food contamination exist…….

at each step in the flow of food	***1***
only during the preparation and service of food.	2
only with potentially hazardous food.	3
only when leftover foods are used.	4

3.6 if you suspect microbial contamination by bacteria, hands should be washed by……..

Rinsing under warm water with soap for at least 10 seconds	1
Washing with soap and cool water for at least 10 seconds	2
Rising under warm water for at least 20 seconds	3
Washing with soap and warm water for at least 20 seconds	***4***

3.7 The practice most likely to result in cross contamination of food is……..

Cleaning and sanitizing cutting boards after cutting raw poultry.	1
Serving cooked chicken with a pair of tongs.	2
Breading raw chicken using clean disposable gloves, then refrigerating the chicken until the chicken is ready to be cooked.	3

Using a cutting board to cut raw chicken for grilling, then to shred lettuce for a salad.	***4***

SECTION 4. KNOWLEDGE ON TEMPERATURE CONTROL

4.1 The temperature danger zone for most food items is……..

32^0F and 180^0F (0º and 82ºC)	1
40°F – 140°F (4.5°C – 60°C)	2
41ºF and 135ºF (5ºC and 60ºC)	***3***
41ºF and 145ºF (5ºC and 63ºC)	4

4.2 Raw meat that is thawing should be stored…….

on the top shelf of the refrigerator.	1
on the middle shelf of the refrigerator.	2
on the bottom shelf of the refrigerator.	***3***
Any shelf in the refrigerator is acceptable.	4

4.3 Poultry is safe to serve if the internal temperature is…….

140^0F (60°C)	1
155^0F (68°C)	2
165ºF (74ºC)	***3***
180^0F (82ºC)	4

4.4 Previously cooked foods must be thoroughly reheated to……

140^0F (60°C)	1
155^0F(68°C)	2
165^0F (74ºC)	***3***
180^0F (82ºC)	4

4.5 The safest way you use to thaw (defrost) food is to…….

Keep container at room temperature	1
Sink with hot running water	2
Sink at room temperature over night	3
Keep in the refrigerator	***4***

4.6 Which is the correct way to store a prepared meal for 2 hours?

1	***Store it in the refrigerator and reheat it when the child is ready to eat it***
2	Place it on the kitchen counter until the child is ready to eat it
3	Store it in a cool oven until the child is ready to eat it
4	Store it in a warm oven until the child is ready to eat it

4.7 What will be the safest way to cool a large pot of hot soup?

1	Put the soup in a clean shallow pan and refrigerate right away
2	Keep the soup in the cooking pot and refrigerate right away
3	Put the soup in a clean, deep pot before and refrigerate right away
4	***Cool the soup to room temperature on the counter, then refrigerate it***

4.8 Which is the correct duration to store beef hamburger patties in the refrigerator?

1	1-2 days
2	***3-4 days***
3	5-7 days
4	More than a week

SECTION 5: FOOD SAFETY ATTITUDE OF CONSUMERS (to be answered by only Consumers)

Rate the food safety attitude of consumers in the hospitality industry below:

	Purchasing practice	Always	Frequently	Sometimes	Rarely	Never
5.1	Do you check the expiration date before purchasing food products?	1	2	3	4	5
5.2	Do you check for buckling or bulging food cans?	1	2	3	4	5
5.3	Do you check food packages if they have been opened or damaged?	1	2	3	4	5
5.4	Do you check cooling temperature for frozen food?	1	2	3	4	5
5.5	Do you follow storage instructions printed on the food products?	1	2	3	4	5
5.6	Do you follow preparation instructions printed on some products?	1	2	3	4	5
5.7	Do you make sure that product is free of preservatives?	1	2	3	4	5
5.8	Do you make sure that the product is free of industrial pigments?	1	2	3	4	5
5.9	Do you put frozen foods in the freezer immediately on reaching home?	1	2	3	4	5
5.10	Do you give attention to the ingredients of the product you purchase?	1	2	3	4	5
5.11	Do you give attention to the amount of calories the product contains?	1	2	3	4	5

5.12	Do you pay attention to the cleanliness of the store you purchase your food from?	1	2	3	4	5

SECTION 6: FOOD SAFETY AWARENESS OF CONSUMERS (to be answered by only Consumers)

	Statement	**Strongly agree**	**Agree**	**Strongly disagree**	**Disagree**	**Don't know**
6.1	For greater safety, ground beef patties should be cooked until they are no longer pink	1	2	3	4	5
6.2	Pork cooked rare and medium is completely safe to eat	1	2	3	4	5
6.3	Freezing food kills all bacteria that may cause illness	1	2	3	4	5
6.4	Cooked food should be cooled to room temperature before refrigeration or freezing	1	2	3	4	5
6.5	Leftover foods can be safely kept at room temperature several hours	1	2	3	4	5
6.6	Irradiation of meat or poultry will destroy bacteria that causes food-borne illness	1	2	3	4	5

SECTION 7: MANAGEMENT COMMITMENT TO FOOD SAFETY (to be answered by only mangers/supervisor)

7.1 How often do you monitor your staff regarding the application of food safety and procedure manuals?

Daily	Weekly	Monthly	Once a term	Seldom	Never
1	2	3	4	5	

7.2 Do you delegate any of the food safety monitoring duties to any other staff members?

1	Yes
2	No

7.3 How frequently does an Environmental Office/Health inspector visit your facility? (Select one).

Once a month	Once a term	Twice a year	Once a year	Less than once a year	Never
1	2	3	4	5	6

SECTION 8: EXISTENCE OF FOOD SAFETY POLICIES AND PROCEDURES (to be answered by only mangers/supervisor)

8.1 Do you have written policies and procedures regarding each of the following? (Answer all options, 1=Yes and 2= No).

8.1.1

Receiving		Storage		Serving		Hygiene		Administration	
1	2	1	2	1	2	1	2	1	2

8.2 Do you have written policy and procedures for personal hygiene for employees and all visitors in place?

1	2

8.3 Do you have personal hygiene policy and procedures followed by every person who enters the production or service area?

1	2

8.4 Indicate which of the following guidelines have been developed in your facility (answer all options, 1=Yes and 2 =No)

1	2	Food storage procedures
1	2	Procedures for personal hygiene of foodservice staff
1	2	Cleaning and disinfection of surfaces and equipment
1	2	Temperature monitoring of foods

8.5 Have educational courses or trainings on HACCP (Hazard Analysis and Critical Control Points) and food hygiene for foodservice staff been given?

1	Yes
2	No

8.6 Early/During the previous year, did you provide employees an opportunity to attend a food safety certification program**?**

1	Yes
2	No

8.7 Did the food handlers receive training?

1	Yes
2	No

THANK YOU FOR YOUR PARTICIPATION!

Yours truly,

Precious Mngoma

APPENDIX 2: CONSENT FORM

TITLE OF RESEARCH PROJECT

FOOD SAFETY KNOWLEDGE AND AWARENESS IN THE HOSPITALITY INDUSTRY

Dear Mr/Mrs/Miss/Ms_____ Date...…/…….../20.....

NATURE AND PURPOSE OF THE STUDY

Thank you for agreeing to participate in this important research study aimed at investigating the “attitude, knowledge and food safety awareness of food handlers and consumers in the hospitality industry”. This research will provide answers to questions about the safety of food provided in the hospitality.

The questionnaire will capture data on demographics of food handler’s, consumers and mangers/supervisors of the hospitality facilities, food safety knowledge and measures. Participants will answer the questions, which will take about 20 minutes to complete. The research study will identify gaps in food safety knowledge and awareness among food handlers and consumers as well safety measures in place to ensure the safety of food provided to consumers.

RESEARCH PROCESS

The researcher will food handlers, consumers, and managers/supervisors of the hospitality operators to complete the questionnaire. Questionnaires will be given to participants, and they will be asked to complete a questionnaire relating to food safety knowledge, and awareness in the hospitality operations. The demographic information such as gender; age; ethnicity; marital status and level of education will be recorded.

CONFIDENTIALITY

The ratings of your assessments of the research instruments as well as your opinions are viewed as strictly confidential, and only members of the research team will have access to the information. The data published in the dissertations and journals will not contain any information by means of which you may be identified. Your anonymity is therefore ensured.

WITHDRAWAL CLAUSE

I understand that I may withdraw from the study at any time. I therefore participate voluntarily until such time as I request otherwise.

POTENTIAL BENEFITS OF THE STUDY

The findings of this research will give an insight on the current level of food handlers and consumer's food safety knowledge and awareness to hospitality industry. These findings, with appropriate recommendations will be made to the relevant the hospitality industry for possible intervention and these findings will facilitate the development of a food safety.

INFORMATION (contact information of your supervisor)

If there is any question concerning this study contact DR JJ Sibanyoni, 011 471 3077, Department of Life and Consumer Sciences, UNISA.

CONSENT

I, the undersigned, ……..… (full name) have read the above information relating to the project and have also heard the verbal version and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects of the project with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that I may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person or reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received a signed copy of this consent form.

Signature of participant: .....

Signed at …… on ……

WITNESSES

1 .....

2 .....

APPENDIX 3: ETHICS CLEARANCE

UNISA university of south africa

CAES HEALTH RESEARCH ETHICS COMMITTEE

Date: 08/04/2019

NHREC Registration # : REC-170616-051
REC Reference # : 2019/CAES/077
Name : Ms PMT Mngoma
Student #: 53028074

Dear Ms Mngoma

Decision: Ethics Approval from 04/04/2019 to 31/03/2020

Researcher(s): Ms PMT Mngoma
53028074@mylife.unisa.ac.za

Supervisor (s): Dr JJ Sibanyoni
sibanjj@unisa.ac.za; 011-471-3077

Dr D Beswa
beswad@unisa.ac.za; 011-471-3644

Working title of research:

Food safety knowledge and awareness in the hospitality industry

Qualification: M Consumer Science

Thank you for the application for research ethics clearance by the CAES Health Research Ethics Committee for the above mentioned research. Ethics approval is granted for a one-year period, **subject to submission of the relevant permission letters**. After one year the researcher is required to submit a progress report, upon which the ethics clearance may be renewed for another year.

Due date for progress report: 31 March 2020

Please note the points below for further action:

1. The researcher is cautioned that permission must be obtained from the management of the targeted hotels and restaurants before interviewing their employees. These permission letters must be submitted to the committee as they are obtained, for record purposes.
2. Unisa has a standard consent form that must be used to obtain consent from participants. The researcher may not use any other consent form, and is requested to

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

submit the corrected draft consent form to the Committee for record purposes. The forms are provided on the college website: https://www.unisa.ac.za/sites/corporate/default/Colleges/Agriculture-&-Environmental-Sciences/Research/Research-Ethics

3. The questionnaire asks for the name of the restaurant/hotel – is it essential to the success of the research that the names be recorded? Can the researcher rather make use of codes or pseudonyms? If it is essential, how will the researcher store these questionnaires and safeguard the anonymity of the establishments in general?
4. The researcher is advised to add a 'Don't know' option to questions where applicable, as respondents may otherwise simply guess when they don't know.
5. More detail is required on the data analysis – how will the descriptive statistics, ANOVA and regression analysis be done?

*The **low risk application** was **reviewed** by the CAES Health Research Ethics Committee on 04 April 2019 in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.*

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the Committee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.
5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

research. Secondary use of identifiable human research data require additional ethics clearance.

7. No field work activities may continue after the expiry date. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

*The reference number **2019/CAES/077** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours sincerely,

Prof EL Kempen
Chair of CAES Health REC
E-mail: kempeel@unisa.ac.za
Tel: (011) 471-2241

Prof MJ Linington
Executive Dean : CAES
E-mail: lininmj@unisa.ac.za
Tel: (011) 471-3806

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150
www.unisa.ac.za

APPENDIX 4: PROFESSIONAL LANGUAGE EDITING

EDITORIAL

CERTIFICATE

Author: Mngoma Precious Mavis Thulile (53028074)

Document title: Food Safety Knowledge and Awareness in the Hospitality Industry

Date issued: 22/04/2021

GIFT AND FRIENDS (PTY) LTD

This document certifies that the above manuscript was proofread and edited by Dr Gift Mheta (PhD, Linguistics).

The document was edited for proper English language, grammar, punctuation, spelling and overall style. The editor endeavoured to ensure that the author's intended meaning was not altered during the review. All amendments were tracked with the Microsoft Word "Track Changes" feature. Therefore, the authors had the option to reject or accept each change individually.

Kind regards

Dr Gift Mheta (Cell: 073 954 8913)

APPENDIX 4: TURNIT IN REPORT

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	P M T MNGOMA
Assignment title:	Revision 2
Submission title:	Attitudes, knowledge and food safety awareness of food han...
File name:	mngoma_PMT_final_dissertation_turn_it_in.docx
File size:	3.62M
Page count:	88
Word count:	24,768
Character count:	137,360
Submission date:	21-Aug-2022 04:43PM (UTC+0200)
Submission ID:	1884991531

ABSTRACT

Food-borne illnesses are a global concern affecting the food services industry. Like other eating establishments, the hospitality industry is prone to foodborne illnesses. Food safety knowledge and awareness of food prepared unhygienically pose potential hazards, and several campaigns have been launched a reduction to the foodborne incidences. The aims of this study measures safety attitudes, knowledge and, awareness in the hospitality industry based on the uMhlathuze Municipality in KwaZulu-Natal, South Africa. The nature of the research design for this study was cross-sectional and quantitative. The levels of food safety practices within the hospitality industry to fight against food-borne illnesses are also measured. Respondents were individuals who are 18 years or more, employed and making use of services offered in the hospitality establishments. A total size the of the study was randomly selected with 101 managers, 110 food handlers, and 170 consumers and as participants to the study. The consent was signed by all participants. The data collected was through self-administered questionnaires with sub-sections targeting managers, food handlers, and consumers eating food prepared out of the household. Data analysis was done using SPSS version, cross tabulations and Chi-square tests of $p<0.05$. The data representations were through graphs and tables were used graphically. Sixty-six percent of food handlers had good food safety knowledge and awareness represented results of this study. The results further showed that 77% of consumers had knowledge on food safety importance. Less than half (36%) of managers ensured to monitor food safety but through hygiene policies and procedures complied to safety in food.

This interval existence in food safety knowledge and awareness within the hospitality industry and attention is revealed needed on temperature monitoring and the food safety policies and procedures developments to prevent the occurrence of food-borne diseases outbreaks and improved consumer food safety awareness within the hospitality industry.