KNOWLEDGE AND PRACTICES OF FOOD SERVICE STAFF REGARDING FOOD SAFETY AND FOOD HYGIENE IN THE CAPRICORN DISTRICT HOSPITALS IN THE LIMPOPO PROVINCE, SOUTH AFRICA

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D M MASHUBA

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by

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DECLARATIONS

I declare that the mini-dissertation hereby submitted to the University of Limpopo, for the degree of Masters of Public Health has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution, and that all material contained herein has been duly acknowledged.

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Mashuba D M (Ms) 05 January 2016

DEDICATION

I dedicate this research to God Almighty who made it possible for me to accomplish my goals throughout my academic journey. I also dedicate this research to my loving parents, husband, son and family members who supported me through all the difficulties till this far.

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ABSTRACT

The purpose of this study was to assess the knowledge and practices of food service staff regarding food safety and food hygiene in Capricorn District hospitals, Limpopo Province. Quantitative, cross-sectional research was conducted to determine the knowledge and practices of food service staff. A convenient sampling technique was employed to select 84 food service staff members (11 food service supervisor and 73 food service aids). Data collection was done using structured questionnaires. Food service staff members consisting of food service aids and food service supervisors participated in the study. The data were analysed using the statistical package for social sciences version 23. Of the respondents 50 (60%) are female whereas 34 (40%) are males. The largest group of them, 34 (40%) had secondary education, 23 (27%) had matric whereas 16 (19%) had post matric qualifications. 80 (95%) of them answered correctly that they use an air dryer or paper towel for drying hands after washing whereas 65 (77%) answered incorrectly when asked the difference between washing and sanitizing. Seventy eight of the respondents answered correctly on practice questionnaire that they only reheat leftovers once whereas 69 (82%) answered incorrectly about the temperature one should maintain for potentially hazardous food that has been cooked and needs to be reheated. In this study a significant correlation was observed between level of education and knowledge, with p-value 0.016 and again between level of education and practices (p-value 0.024), also between work activity and practice (p-value 0.021). There was significant difference between knowledge level and practice with p-value 0.045. The result of the study suggest that although most food service staff are knowledgeable regarding some aspects of food hygiene and food safety significant gaps remains in food safety practices, posing risk to hospitalised patients who are already vulnerable. There is a need for training in areas were food service staff are lacking knowledge.

DEFINITION OF CONCEPTS

Critical control point – is a step at which control can be applied and is essential to prevent or eliminate a food safety hazard or reduce it to an acceptable level (FAO/WHO Food Standards Programme, 2001).

Food safety – assurance that food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use (FAO/WHO Food Standards Programme, 2001).

Food borne illness (food poisoning) – is a general term for health problems arising from eating contaminated food (Medical Dictionary).

Food handlers – is defined as anyone who is engaged in any of the processes which make up, or are ancillary to, food processing (e.g. cooks, wash-up, waitresses etc.) even though they might not handle food directly (South African Health Act 63 of 1977). In this study *food handler* refers to the food service staff which includes food service managers, food service aids and food service supervisors.

Food hygiene – The practices which should be followed to make sure that food is safe and wholesome throughout all the stages of production from purchase to consumption (Meggitt Carolyn, 2003).

Food service aid – a worker who prepares, portions and serves food and is are employed by the hospital or by another health care establishment.

Food service staff – in this study it includes any person who comes in contact with food; it can be a food service manager, food service supervisor or food service aid.

Food service supervisor – a person who supervises, directs and co-ordinates the activities of workers who prepare, portion and serve food; he or she is employed by the hospital or by another health care establishment (National Occupational Classifications (NOC), 2011).

Personal hygiene – The way a person maintains their health, appearance and cleanliness (Meggitt Carolyn, 2003).

LIST OF ABBREVIATIONS

CDC – Centers for Disease and Control

CSPI – Centre for Science in the Public Interest

FAO – Food and Agriculture Organization

HACCP – Hazard Analysis Critical Control Point

NOC – National Occupational Classification

UK – United Kingdom

SPSS – Statistical Package for the Social Sciences

WHO – World Health Organization

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CHAPTER 1

INTRODUCTION

1.1. Background Information

Food safety is defined as the conditions and measures that are necessary during production, processing, storage, distribution and preparation of food to ensure that it is safe, sound and fit for human consumption (Griffith, 2006). Food is considered safe when it is free from chemical, biological or physical hazard that may result in illnesses or even death to the consumer.

In hospitals, food service personnel are the ones responsible for preparing food for patients. All food service personnel who are directly in contact with food are identified as food handlers. Food handlers can easily pass on harmful bacteria unto food through bad personal habits (like licking fingers or playing with a lock of hair), carrying food pathogens in their hands, cuts, sores, mouth and skin, which can make it unsafe for consumption (McWilliams, 2007). It is therefore important that the food service personnel maintain proper hygiene standards.

The main aim of food hygiene is to prevent food poisoning and other foodborne illnesses. Epidemiological and surveillance data suggest that faulty practices in food handling, storage and processing may play an important role in the causal chain of foodborne illnesses. Therefore, if proper food and personal hygiene is not well practiced this might put patients at risk of foodborne illnesses, particularly those at greater risk, which are children, pregnant women, the elderly and those with chronic diseases (Tauxe, Doyle, Kuchenmuller et al., 2010; WHO, 2002).

It is estimated that 48 million foodborne illnesses occur in the United States (US) annually, with 128 000 people being hospitalized and 3 000 dying from eating contaminated food (Centers for Disease and Control (CDC), 2010). Pathogens known to be responsible for foodborne illnesses in the US include Salmonella, norovirus, Campylobacter, Toxoplasma, Escherichia coli 0157:H7, Listeria and Clostridium perfringes (CDC, 2010). In the African region data regarding foodborne illnesses are very scarce but studies have shown that the most prevalent pathogens are: Campylobacter, Salmonella, Shigella, Hepatitis, Brucella,

Staphylococcus aureus, Bacillus cereus, Escherichia coli and rotavirus (Centre for Science in the Public Interest, CSPI, 2005).

The World Health Organization (WHO) has long been aware of the need to educate food handlers about their responsibilities for food safety; therefore they have been introducing the *Five Keys to Safer Food* which include: keep clean, separate raw from cooked, cook food thoroughly, keep food at safe temperature and use safe water and raw materials (http://www.who.int/food safety, accessed 04/02/2014).

Effective management of microbiological hazards can be enhanced by making use of preventative approaches, providing continuous education to food handlers on food hygiene and food safety, ensuring that monitoring systems are in place and increasing the power of health inspectors with regards to food inspection. The WHO (2002) reported that the control of safety during the manufacturing process and handling of food is best achieved by means of the Hazard Analysis Critical Control Point (HACCP) technique.

It is therefore critical that personnel responsible for food services maintain proper food safety and hygiene practices in order to prevent foodborne illnesses among patients. This study thus aims to assess knowledge and practices of food service staff regarding food safety and food hygiene in the Capricorn District hospitals in the Limpopo Province.

1.2. Problem statement

Serving safe food has numerous benefits. One of them is the prevention of foodborne diseases. Foodborne illnesses do not only affect people's health but can also have a negative impact on the economic state of the institution, as it might prolong the period of stay in the hospital and medical expenses. Institutions can therefore avoid legal fees, medical claims, wasted food and bad publicity by providing microbiologically safe food to patients.

The enforcement of food hygiene legislation such as HACCP is important (WHO, 2002), but legislation alone cannot prevent food poisoning. Negligence, ignorance and lack of knowledge by food handlers are believed to be the most common causes of food contamination (Jianu & Chis, 2012). In my observation, I have noticed that the food service staff in the hospital I visited was not adhering to proper food and personal hygiene practices while preparing food for patients and this may predispose patients to foodborne illnesses.

This raised a concern whether the practice was common in all hospitals or if the challenge was faced by that particular hospital alone.

Most of the studies on knowledge, attitude and practices of food service staff have been done in private catering institutions (Giritlioglu, Batman & Tetik, 2011, Jevsnik, Klebec & Raspor et al., 2008, Jianu & Chris, 2012; McIntyre, Vallaster, Wilcott et al., 2013, Soares, Almeida, Cerqueira et al., 2012). Studies conducted in the public health sector mainly focused on nursing personnel as the last vehicle to transport food to patients (Buccheri, Casuccio, Giammanco et al., 2007, Tokuc, Ekuklu, Berberoglu et al., 2009) whereas some focused on managers as the main drivers for a food safety and food hygiene program in the institutions (Marais, Conradie, & Labadarios, 2007). Only few studies have focused on the food service staff, and to date only limited data exist concerning the knowledge and practices of food safety and food hygiene in the Limpopo Province. Hence the need arises to conduct this study amongst the food service staff (*food service aids* and *food service supervisors*) as they are the ones mainly responsible for food preparation.

The purpose of this study was to assess the knowledge and practices of food service staff regarding food safety and food hygiene in the public hospitals of the Capricorn District, Limpopo Province.

1.3. Aim of the study

The aim of this study was to determine the knowledge and practices of food service staff regarding food hygiene and food safety in the Capricorn District hospitals in the Limpopo Province.

1.4. Objectives

- To determine the demographic characteristics of the food service staff in the public hospitals of the Capricorn District, Limpopo Province.
- To determine the knowledge of food service staff regarding food hygiene and food safety in the public hospitals of the Capricorn District, Limpopo Province.
- To determine the practices of food service staff with regard to food hygiene and safety in the public hospitals of the Capricorn District, Limpopo Province.

- To determine the association between demographic profile and knowledge and practices of food service staff in the public hospitals of the Capricorn District, Limpopo Province.
- To determine the association between knowledge and practices of food service staff in the public hospitals in the Capricorn District, Limpopo Province.

1.5. Research questions

What are the knowledge and practices of food service staff regarding food safety and food hygiene in the Capricorn District hospitals in the Limpopo Province?

1.6. Structure of the dissertation

Chapter 1: presents the background of the study as well as the purpose of the study which include the aims, objectives and the research question.

Chapter 2: this is where literature regarding knowledge and practices of food service staff on food safety and food hygiene is reviewed.

Chapter 3: outlines the methodology used in the study.

Chapter 4: presents data analysis and discussion of findings.

Chapter 5: contains conclusion, limitation of the study and recommendation for future research.

In this chapter the researcher discussed the background of the study, research problem, research question, aim and objectives of the study, as well as organisation of the subsequent chapters. Literature around food safety and food hygiene will be discussed in the next chapter.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This section introduces similar studies that have been conducted in this area of research. Its main focus is on previous work done in relation to the knowledge and practices of food service workers. In this section, literature on food poisoning and their causes as well as knowledge and practices of food service workers regarding food hygiene and food safety is reviewed. Different legislature governing hygiene and safety has also been reviewed.

2.2. Overview

Food poisoning is an illness resulting from the consumption of food contaminated with an infectious or toxic agent (Trickett, 2001). Section 7 of the UK Food Safety Act (1990); states that food fails to comply with "food safety requirements" if it has been rendered injurious to health, if it is unfit for human consumption, or if it is contaminated to such an extent that it could not reasonably be expected to be used for human consumption.

One of the regulations of section 2(1)(b)(i) of the Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972) of South Africa states that no foodstuffs should contain microorganisms at levels which may cause harm to human upon consumption. The South African Policy for Food Service Management in Public Health Establishments defines safe food as food that is high in quality, which has been selected, prepared, and served in such a way that it retains its natural flavour and identity, is nutritious and is free of unsafe bacteriological or chemical contamination (RSA Department of Health, 2010).

In South Africa food poisoning is a notifiable disease; however food related illnesses are conditions that are at times clinically mild and are less likely to be reported as people are less likely to seek medical attention. These foods related illnesses remain underreported throughout the world and in South Africa; records of foodborne illnesses are not efficiently documented. Although foodborne disease outbreaks are common in the country, literature regarding these incidences is insufficient (RSA Mpumalanga Department of Health, 2009). As a result, many food-related illnesses are not diagnosed and associated foodborne disease outbreaks are often not recognised (RSA Mpumalanga Department of Health, 2009).

Every year thousands of people suffer from food poisoning as a result of eating food that may look, taste and smell perfectly normal but is, in fact, contaminated with large numbers of harmful bacteria (Tricket, 2001). Neglecting the principles of food hygiene and food safety can lead to increased morbidity and mortality due to food poisoning or foodborne illnesses.

Poor and faulty food handling practices have been identified as the leading cause of the majority of foodborne diseases (Clayton, Griffith, Price et al., 2002). Worsfold & Griffith (2003) agree that food from unsafe sources; inadequate cooking, improper holding times and temperature abuses, food handlers' malpractices or a combination of these have a linkage with food service operations.

2.3. Incidences of foodborne illnesses

Approximately 334 and 1 180 food poisoning cases were reported in Mpumalanga from January to October 2008 and January to November 2009, respectively (RSA Mpumalanga Department of Health, 2009). Of the 334 cases reported, 54 were recorded among the Spitskop mine workers. Investigations revealed that the cause of the outbreak was attributable to unacceptable hygienic conditions at a café in the Breyton Spitskop mine (RSA Mpumalanga Department of Health, 2009).

One of the recent outbreaks was reported in Mokopane, Limpopo Province, where about 42 health officials attending workshop suffered severe diarrhoea after eating food at a lodge. The officials were admitted and treated for severe diarrhoea at Voortrekker hospital and the tests showed that the diarrhoea was caused by food poisoning. The tests showed that the lodge food was contaminated with Salmonella Enteritidis (Mandiwana, 2014, Matlala, 2014).

The South African Communicable Diseases Surveillance Bulletin, 2010, reported food poisoning outbreak among funeral attendees in the Tshivhilwe Village, Vhembe District. Out of 400 people who attended the funeral, 193 (48%) reported illness. They presented themselves with common symptoms which included: diarrhoea, fever, arthralgia, headache and vomiting. Among them 3 were hospitalised and no fatalities were reported.

In a study that determined the level of bacterial contamination on hands of food handlers who work in the kitchen of a military training hospital, 16 different bacteria were isolated, of

which the most common was Staphylococcus aureus (70.0%), followed by coagulase-negative Staphylococci (56.7%), diphtheroid bacilli (21.7%), Bacilli spp (10.5%) and Escherichia coli (7.8%). Poor hand hygiene was indicated by high levels of Staphylococcus aureus and Escherichia coli on sample taken from bare and gloved hands (Aycicek, Aydoganb, Kucukkaraaslan et al., 2004).

2.4. Causes of foodborne illnesses

The Centre for Disease Control and prevention (CDC) has identified five risk factors related to the human factor and preparation methods that contribute to the high prevalence of foodborne illnesses. The five risk factors are improper holding temperatures, inadequate cooking, contaminated equipment, food from unsafe source and poor personal hygiene (CDC, 2010).

Food, if not handled hygienically, could be a mode for transmission of hazards (Mensah Mwamakamba, Mohamed et al., 2012) and the contaminated food can pose a health threat, a problem that is serious in developing countries due to difficulties in securing optimal hygienic food handling practices. A hazard is an agent that is reasonably likely to cause illness or injury in the absence of its control. Hazards can be introduced into hospital food service unit in numerous ways: by employees, food equipment, cleaning supplies and customers. Hazards that are known to cause foodborne illnesses include: microbiological, chemical and physical hazards and allergens (The National Restaurant Association Educational Association, 2012).

2.4.1. *Microbiological Hazard*

Microbiological hazards are considered to be the greatest risk to the food industry (Garden-Robinson, 2007). Foodborne infections due to microbial contamination loads contained in food and water have been widely reported (Cunningham, Rajagopal, Lauer et al., 2011, Uyttendaele, Busschaert Valero et al., 2009). The microorganisms responsible for most foodborne illnesses include: bacteria and their toxins, viruses and parasites (Fraser, 2003).

Studies have shown that bacteria, parasites and viruses continue to be the major aetiological agents in children with diarrhoea. In a study of 1 225 paediatric patients attending outpatient clinics in Ethiopia parasites were detected in 337 (30.7%) cases, Salmonella in 65 (5.3%),

and Shigella in 61 (4.9%) (Beyene, Nair, Asrat et al., 2011). Parasites in food are usually tiny worms that live in fish, pork or meat and may be found in contaminated water.

Viruses are small and it only takes a few to make a person sick (illnesses such as chicken pox, common cold and influenza are all caused by viruses spread from people coughing or sneezing (Fraser, 2003). Viral contamination usually occurs through unclean hands of someone that touched the food. Lack or improper hand washing of food handlers has been implicated in several studies (Aycicek et al., 2004, Campos Coutu, Soares Cardonha, Pinheiro et al., 2009). Therefore, to prevent these common illnesses one must be careful of personal hygiene, especially when working with food. Viruses are different than bacteria in that they do not grow on food; they simply use food as a vehicle to get from one person to another (Fraser, 2003).

Bacteria, unlike viruses, can grow in food. They are found everywhere and can grow when food handlers are not careful about time, temperature and cleanliness. Bacteria that cause foodborne illness come from sources like soil, animals, raw meat and people. People are one of the major sources of microorganisms that cause foodborne illnesses. Approximately 10 – 20% of foodborne disease outbreaks are due to contamination by food handlers (Kasturwar & Mohd, 2011). Bas, Ersun and Kivanc (2006) also agree that food handlers themselves may be sources of organisms, either during the course of gastrointestinal illness or during convalescence, when they no longer have symptoms.

Microorganisms are everywhere, in the air, on our skin and hair, on our hands and nails, in our noses and mouths, on the surface of food, in our intestinal tracts, on our clothes, on kitchen equipment, in garden soil and in water (Stretch & Southgate, 1998). About 10 – 30% of healthy persons carry bacteria in the nose, skin, axilla, perineum and throat (Luby, Faizan & Fisher Hoch, 1998). The most important factors that affect the growth of microorganisms are food that is not handled properly, high moisture, improper temperature at which food is handled, time, light, oxygen and the degree of acidity (Gauteng Department of Health; Safety Manual Circular No 85 of 1993).

Factors that affect bacterial growth

Food	Bacteria grow best in potentially hazardous food, which are

	moist, low acid, and have some protein. Bacteria have much the same nutrient requirements as people do. Once bacteria have used up the available nutrients they stop growing.
Time	Bactria still require time to grow. The time required to grow to a certain level is dependent on the bacterial species and the conditions in their surrounding environment.
Temperature	Bacteria grow over a wide range of temperatures. Temperature is the most widely used method to control bacterial growth. Bacteria grow slowly at temperatures below 5°C. They begin to die at 57°C or more.
Water	Bacteria need water to grow. Foods that have a water activity of 0.85 or higher can support the growth of bacteria. Water activity is a measure of how much water is available to the bacteria.
Oxygen	Some bacteria require oxygen to grow (aerobes) while others can grow only in the absence of oxygen (anaerobes). However, many bacteria grow under either condition and these bacteria are called facultative anaerobes.
Acidity	Bacteria cannot grow well in high-acid foods. Most bacteria grow in food that has a pH of 4.6 or higher. pH is a measure of how acidic or alcaline in a product is. It is indicated on a scale from 0 to 14, with 7 being neutral. If the pH value is below 7, the food is acidic; if it is above 7, the food is alkaline.

Csiro Food and Nutritional sciences. 2010. Make it Safe: A guide to food safety. Australia. Csiro Publishing

2.4.2. *Chemical hazard*

Chemicals may cause foodborne illness if they get into food. Chemicals such as additives, detergents, sanitizers, pesticides and industrial chemicals must be stored away from food, utensils and food preparation areas in order to avoid contact with food (The National Restaurant Association Educational Association, 2012). Some chemicals are added to food on purpose, these include preservatives and colouring. Other chemicals can get into food by

accident through cross-contamination, like insecticides, rodenticides or cleaning chemicals (Csiro, 2010).

Additional substances found naturally in food can cause illnesses when eaten by people who are allergic or sensitive to them (e.g. peanuts). Types and sources of chemicals in food that may cause illness if eaten include: protein or other substances that may cause allergic reaction, approved food additives, such as chemical preservatives if used incorrectly, residue from cleaning and sanitising chemicals, deliberate or accidental addition of chemical not approved for use in food and chemicals leaching from packing into food (Csiro, 2010).

In China in 2008 a major foodborne illness outbreak was caused by intentional misuse of an industrial chemical, melamine. Melamine was added to milk used to make infant formula and other dairy products. This was done deliberately to make it appear as if the milk had higher levels of protein than were actually present. An estimated number of 300 000 infants and young children became ill, more than 50 000 of those affected were hospitalised for kidney stones or other urinary tract issues (Csiro, 2010).

If chemicals need to be stored in the kitchen area, they must be stored in an establishment that is authorised for use or below food or food-contact surfaces so that they do not drip into food (Tricket, 2001).

2.4.3. *Physical hazard*

Physical hazards are objects in food that may cause injury if eaten; they may include pests, glass, stones, wood, metal, bones, dirt, flaking paints, grease oil, plastic, jewellery or any other object that accidentally gets into food. These objects could cause anything from a small cut to possible choking. Physical hazards usually happen because of unsafe food handling practices or accidental contamination (Tricket, 2001).

Over 200 school pupils in Sekhukhune (Limpopo) have been examined at 2 hospitals for food poisoning. Of the 200 pupils, 100 were examined, treated and released at the Jane Furse Hospital while 3 pupils were institutionalised. Another 133 were taken for examination to St Ritas hospital on the same day, and 2 pupils were admitted at the hospital. The investigations found that every bag of beans opened in different schools contained small stones and pieces of glass (http://citizen.co.za/273962/200).

Good personal hygiene and proper food handling practices can minimise the transfer of pathogens from food handlers to consumers. Food hygiene rests directly on the state of personal hygiene and habits of the personnel working in the establishment (Ifeadike, Ironkwe, Adogu et al., 2014).

2.5. Personal habits affecting food safety

Poor personal hygiene has been identified as one of the factors contributing to the causes of foodborne illnesses (Mead, Slutsker, Dietz et al., 1999). When food handlers do not practice proper personal hygiene or correct food preparation, they may become vehicles for micro-organisms, through their hands, cuts or sores, mouth, skin and hair among others (Silva et al., 2003).

2.5.1. *Hair*

Human hair can pose as a physical and microbial hazard / contamination. Hair can easily get into the food as food handlers touch or scratch their heads, as they unintentionally brush their hair from their foreheads and back of the neck without even realizing that they are doing it. Hair also carries microorganisms and dandruff and should therefore be kept out of food to prevent food contamination (Michael, 1989). Therefore, wearing hairnets or hats helps to keep hair out of food and also makes the food handler aware of touching their head or hair.

2.5.2. *Hands and nails*

Hands and nails can easily pick up germs; hence they need to be cleaned well to keep dirt and germs from contaminating food (South Africa, 1977). Food handlers need to pay extra attention to their fingernails by keeping them short as dirt can get stuck easily under fingernails, especially if they are long.

2.5.3. *Nose and mouth*

Touching the nose could contaminate one's fingers and hands and therefore food handlers need to avoid picking their noses. If they do, they will need to wash their hands in an authorised sink for washing hands immediately. Coughing and sneezing also send microorganisms such as Staphylococcus aureus, into the air where they can be breathed in by other people or land on surfaces where food is being prepared. Therefore, anything that comes in contact with contaminated surface will also be contaminated and may result in

foodborne illness. Therefore, food handlers need to ensure that they contain any cough or sneeze, and ensure that any surface contaminated with cough or sneeze is cleaned and sanitized (Michael, 1989).

2.5.4. *Uniform / attire / clothes*

Clean uniform or other clean protective clothing must be worn daily. The uniform should not be worn outside the food service area prior to or during work hours. Clothing, including aprons which become excessively soiled or contaminated during the day should be changed (Michael, 1989).

The food service staff therefore needs to do their utmost in maintaining food safety and hygiene standards in order to prevent the spreading of microorganisms.

2.6. Signs and symptoms of foodborne illnesses

Food poisoning symptoms are generally mild and only last a few days; the person usually recovers without seeking medical care. Nevertheless, high risk groups such as infants, pregnant women, the elderly and those suffering from chronic diseases might react badly as their immune system is compromised (Tauxe et al., 2010).

The signs and symptoms of foodborne illnesses may include diarrhoea (sometimes bloody), nausea, vomiting (which typically last for 2 to 3 days in most individuals), fever, headache, abdominal cramps and pains. However, severe complications which may include stillbirths, hospitalization due to sepsis, haemolytic uremic syndrome, Reiter's syndrome (reactive arthritis), Guillain-Barre syndrome (nerve paralysis), and/death, may occur in certain patients (Linscott, 2011, Gauteng Safety Manual Circular No 85 of 1993, Government of South Australia, 2008).

Foodborne pathogens such as Shigella, Staphylococcus aureus, Bacillus cereus, Clostridium perfringens and Escherichia coli are important causes of morbidity in the world (Wren, 2006). These bacteria cause severe gastrointestinal symptoms such as vomiting and diarrhoea and, in the case of botulism poisoning, may result in death (Blake, Mellor & Crane, 2010). Staphylococcus aureus is responsible for causing a variety of human infections, which may range from minor skin disease to life threatening infections (Tiwari et al., 2009). It colonises

healthy individuals and causes severe infections in hospitalised patients (Muralidharan, 2009).

2.7. Knowledge of food handlers on food hygiene and food safety

A study conducted to evaluate knowledge, attitudes, and practices of nursing staff concerning food safety in two hospitals in Palermo, Italy, has documented a frequent unawareness of foodborne disease hazards, prevention, and control measures. A general lack of knowledge about etiologic agents and food vehicles associated with foodborne diseases and proper temperatures of storage of hot and cold ready to eat foods was reported (Buccheri et al., 2007).

Giritlioglu et al. (2011) assessed knowledge and practice of food safety and hygiene among students in university cookery programs in Turkey which showed that although the students regarded the issue of food safety and personal hygiene as important, they had inadequate knowledge in this area. In another study by McIntyre et al. (2013) in British Columbia, Canada, there was significant decrease in knowledge score in trained workers over a 15 year period after certification. Knowledge scores were significantly higher in trained food handlers than for those who had not been trained. This shows that continuous training is very important to ensure that food handlers' knowledge on food safety and hygiene is up to date and maintained.

Another study, that was done among 200 food handlers in 7 military hospitals, in Jordan (one from the capital Amman and two from the three provinces Northern, Middle and Southern provinces), found that food handlers' knowledge was high with a mean percentage score of 84.83% ± 11.71%. They found that food handlers demonstrated excellent knowledge in the categories of high risk foods, foodborne diseases, food storage temperature and sources of food contamination (Sharif, Obaidat & Al-Dalalah, 2013). In contrast, a study by Siow and Sani (2011) at two residential cafeterias and a canteen of the University Kebangsaan, Malaysia, found that the knowledge level of food handlers was moderate with a mean value of 57.8%. Their knowledge on food storage and preparation temperatures was poor with only 28.0%.

A study done in Accra, Ghana, shows that food handlers have satisfactory knowledge of food hygiene but it was also observed that knowledge was not always put into practice (Annor & Baiden, 2011).

Jianu and Chris (2012) revealed gaps related to microbiological risks, cross-contamination and temperature control which also demonstrated the need for the re-training of food handlers. Gaungoo and Jeewen (2013) in their study for effectiveness of training among food handlers ("A review on the Mauritian Framework") recommended that it should be mandatory for food handlers to undergo a refresher food safety training course prior to renewal of their Food Handler Certificate after its expiry after three years. Therefore, there is a need for continuous training of food handlers on food hygiene and food safety; this might assist in improving knowledge and maintaining the standard of hygiene practices in food service units.

2.8. Food safety and hygiene practices

In a study by Tokuc et al. (2009), self-reported hygiene practices showed that 84.9% of personnel always use gloves while touching and distributing unwrapped foods. Some 94.5% agreed that washing hands before handling food reduces the risk of contamination. The same findings were observed in the study by Sharif et al. (2013) where the food handlers in the military hospitals practiced good hygiene level with a mean percentage score of 89.4% ± 9.1%.

In another study on the knowledge and practice of food safety and hygiene of cookery students in Turkey, it was found that almost all students (97.6%) showed a high level of attention to personal hygiene, while 86.6% of students were aware that hand or finger injuries can cause serious foodborne illnesses (Giritlioglu et al., 2011). When responding to the questions regarding touching food with cuts on hands or fingers that are not properly covered, of the food handlers at primary schools in the Hulu Langat District, Selangor, 97.6% indicated that they never engage in that negative behaviour (Tan et al., 2013).

The general food hygiene regulations place a responsibility on each food handler who knows or suspects that he or she is suffering from certain diseases which may be transmitted through food or is afflicted with an infected wound, skin infection, sores, diarrhoea etc. to report that to the proprietor of the food business in which they are working (Annon, 1995).

The results by Green, Selman, Banerjee et al. (2005) indicate that risky food preparation practices are commonly reported by foodservice workers; 60% of food service workers (EHS-Net study) reported not to always wear gloves while touching ready-to-eat food; 23% and 33% did not always wash their hands or change their gloves between handling raw meat and ready-to-eat food while 53% did not use thermometer to check food temperature and 5% worked while sick with diarrhoea or vomiting.

In a study to assess personal hygiene and practices of food handlers in municipal public schools of Natal, Brazil, it was found that 100% of food handlers did not practice proper hygiene (Aycicek et al., 2004).

Most of the studies showed that members of food staff show a high level of attention to personal hygiene and are aware of the danger of touching food with cut hands or fingers. The studies, however, indicate the need to improve on issues of wearing gloves, washing hands and using a thermometer to check food temperature.

Several bodies in South Africa have devised measures to prevent foodborne illnesses at different sectors and will be discussed in the section below.

2.9. Food control Authorities in South Africa

In South Africa food control is shared between several authorities and various components within the health sector at national, provincial and local levels. The National Department of Health, on behalf of Minister of Health, administers 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 (RSA Department of Health, 2004).

The Provincial Health Services section is responsible for food control at provincial level where it coordinates activities within the provinces, providing support to local authorities and setting protocols and strategies for health within the province. At district level the Environmental Health Services are responsible for food control in their area of jurisdiction. They are involved in health promotion, hygiene control, investigating complaints, law

enforcement and monitoring for compliance to legislation (RSA Department of Health, 2004).

At the district level, district Environmental Health Officers (EHO) are responsible for advising persons in charge of the food service unit on the implementation of HACCP plan, evaluate the level of hygiene in terms of standards, perform sampling for monitoring of the effectiveness of cleaning operations in accordance with prescribed techniques and facilitate interaction and collaboration with other sections including infection control and Health and Safety Committees to ensure food safety in the hospital (RSA Department of Health, 2004).

HACCP is a system in which food safety is managed through the analysis and control of biological, chemical and physical hazards from raw material production, procurement and handling, to manufacturing, distribution and consumption of the finished product (RSA Department of Health, 2010). In South Africa, HACCP is in the process of becoming mandatory, and a regulation concerning the use of HACCP has been published (Regulation Gazette No 7696, 2003).

HACCP is a seven point program to help ensure food safety in the food industry. The HACCP system is being utilised today by the food industry and food service operations such as those in hospitals (McWilliams, 2007).

Each company's plan for HACCP should include the following principles:
Principle 1 – Conduct a hazard analysis
Principle 2 – Determine critical control points
Principle 3 – Establish critical limits for each critical control point
Principle 4 – Establish a monitoring system for each critical control point
Principle 5 – Establish corrective actions
Principle 6 – Establish corrective procedures
Principle 7 – Establish documentation and record keeping

In a study conducted by Angelillo, Viggian, Rizzo et al. (2000) on food handlers and foodborne diseases knowledge, attitudes and reported behaviour in Italy, food safety training and the implementation of the hazard analysis critical control points (HACCP) system was recommended in order to reduce the likelihood of foodborne illnesses in the hospital settings.

The South African Department of Health (2010) also recommend the application of the HACCP programme in order to provide safe food and prevent outbreaks of foodborne illnesses.

The activities of these structures are governed by several legislatures which include:

2.9.1. *The Foodstuffs, Cosmetics and Disinfectants Act 1972 (Act No.54 of 1972)*

The Act governs the manufacture, sale and importation of foodstuffs, cosmetics and disinfectants from a safety/public health point of view. The Act regulates the foodstuffs as well as labelling and advertising of foodstuffs but does not regulate hygiene provisions that relate to the handling and transport of food. Section 2(1) of the Foodstuffs Cosmetics and Disinfectants Act, 1972 (South Africa, 1972) prevents any person from selling food that is unfit for human consumption.

2.9.2. *The Health Act, 1977 (Act 63 of 1977)*

There are several sets of regulations promulgated under the Act that have direct relevance to food safety and are enforced by local authorities in their areas of jurisdiction. The legislations include:

- Regulations Governing General Hygiene Requirements for Food Premises and the Transport of Food (G.N.No.R.918 OF 30 July 1999), which regulate hygiene provisions that relate to handling and transport of food.
- Regulations Relating to Inspections and Investigations (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 make reference to transportation of meat and meat products.

The Health Act, 1977 (South Africa, 1977), makes provision for Environmental Health Practitioners (EHPs) to detain, sample and if necessary seize any foodstuff, in their areas of jurisdiction, which is deemed harmful or injurious to human health.

2.9.3. *The International Health Regulations Act, 1974 (South Africa, 1974)*

The Act provides for the approval by the Department of Health, of the source of food for consumption at ports, airports, on vessels and aircrafts, as well as for the inspection of such premises and the sampling of food by local authorities.

2.9.4. *The Agricultural Products Standards Act, 1990 (South Africa, 1990)*

The Act controls and promotes specific product quality standards for the local market and for export purposes.

2.9.5. *The Meat Safety Act (South Africa, 2000)*

The Act is administered by the Food Safety and Quality Assurance in the Department of Agriculture and enforced by the Departments of Agriculture of the nine provinces. It addresses meat safety and hygiene standards in abattoirs and regulates the importation and exportation of unprocessed meat.

These regulations are meant to protect consumers against consumption of food that could potentially be hazardous.

2.10. Conclusion

This chapter has discussed literature on food safety and food hygiene from the international and national perspective. The researcher has reviewed documents which include various pieces of food safety and food hygiene legislation with specific focus on the concept of food handlers' knowledge and practices, as well as strategies used by other countries in trying to address the issue of food safety and food hygiene in food service units.

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Introduction

This chapter gives overview of the research design used in the study. The study design, study area, study population, sampling, pilot study, data collection and ethical consideration are discussed. The research design enabled the researcher to achieve the aim and the objectives of the study.

3.2. Study design

The study followed a quantitative study approach. Quantitative study is the study that is used to quantify the problem by way of generating numerical data or data that can be transformed into usable statistics. It is used to quantify attitudes, opinions, behaviours and other defined variables and generalize results from a larger sample population (Burns & Grove, 2005). The type of study was descriptive and cross sectional where knowledge and practices of food service staff regarding food hygiene and food safety was described.

In cross sectional studies the entire population or a subset thereof is selected, and from these individuals, data are collected to help answer research questions study (Levin, 2006). Furthermore cross sectional studies are carried out at one time or over a short period. The data in this study were collected only once and have been extrapolated to the entire food service staff members employed in the Capricorn District. Cross sectional studies, also known as surveys, are useful ways to gather information on important health-related aspects of people's knowledge and attitudes. A descriptive study is a study used to describe characteristics of a population being studied (Rubbin & Babbie, 2005).

3.3. Study area

The study was conducted in the Capricorn District, which is the biggest of all five districts in the Limpopo Province, South Africa. It is situated in the centre of the Limpopo Province, sharing its borders with four district municipalities namely, Mopani (East), Sekhukhune (South), Vhembe (North) and Waterberg (West). The district is situated at the core of economic development in the Limpopo Province and includes the capital of the province, that is, the City of Polokwane.

The Capricorn district consists of the following municipalities: Aganang, Blouberg, Lepelle-Nkumpi, Molemole and Polokwane. It has got nine hospitals, namely 2 tertiary hospitals, I

district hospital, 5 regional hospitals and 1 psychiatric hospital, which all have operating food service units. All the food service units are based in the public hospitals, only the psychiatric food service unit is outsourced.

3.4. Study population

The population consisted of food service supervisors and food service aids employed in all the food service units of public hospitals in the Capricorn District, Limpopo Province, South Africa. The total number of food service staff members in the Capricorn District hospitals is 162, which comprises of 12 Food Service Supervisor and 150 Food Service Aids. One hundred and twenty six employees were available during the time of the study, some were off-sick, on leave and others had family responsibilities. One hundred and forty-five questionnaires were distributed to all the employees who were on duty at the time of data collection, and 84 food service staff responded, which amounted to a response rate of 92% for supervisors and 48% for food service aids. The study population consisted of only those participants who gave written consent for participation in the study.

Institution	Number of Food service supervisors	Number of Food service aids	Total
Pietersburg hospital	4	23	27
Mankweng hospital	2	21	23
Seshego hospital	1	13	14
Botlokwa hospital	0	9	9
W F Knobel hospital	1	14	15
Helena Frans hospital	0	8	8
Lebowakgomo hospital	3	15	18
Zebediela hospital	1	12	13
Thaabamoopo hospital	0	9 (26)	9 (26)
Total	12	150	162

*(26) number food service aids on contract

3.5. Sampling method

Purposive sampling was used to select the hospitals while participants were conveniently sampled**.** All the nine Capricorn District hospitals were purposefully selected to participate in the study. Purposive sampling (also called judgemental sampling) is based entirely on the

judgement of the researcher, because a sample is composed of elements that contain the most characteristic, representative or typical attributes of the population that serve the purpose of the study best (Grinnell & Unrau, 2008). Food service staff members were stratified into supervisors and food service aids, the sample size was calculated using Krejcie and Morgan (1994) tables for each strata. Eleven supervisors and seventy three food service aids were conveniently sampled and included in this study. In convenient sampling also called accidental sampling/availability sample respondents are usually those who are nearest and most easily available (de Vos, Strydom, Fouche et al., 2008).

3.6. Inclusion criteria

The study included food service supervisors and food service aids that were present during the time of the study and willing to participate in the study.

3.7. Exclusion criteria

Food service supervisors and food service aids not willing to take part in the study and those who were not present during the time of the study were excluded. Food service managers and dietitians were also excluded from the study as they are more responsible for administration work and for training the food service staff.

3.8. Data collection

Data were collected using a pre-validated self-administered questionnaire adapted from the study by Kajagar (2013) which consisted of closed ended multiple-choice questions. The questionnaire had three parts which were divided into a demographic data section to collect information about the food service staff, as well as knowledge and practices of food service staff. The knowledge and practices level has been divided into two categories based on the scores in the questionnaire; score less than 50% was regarded as poor knowledge and inadequate practice while score above 50% was regarded as knowledgeable and adequate practice respectively. Food safety and food hygiene guidelines, text books and training materials will be used to decide if the answer is considered “correct” or “incorrect”.

3.8.1. *PART 1: Demographic data*

Data such as the age, educational status, years of experience in food service unit, gender, and work activity, of the staff members were recorded in this section.

3.8.2. *PART 2: Knowledge questionnaire*

The questionnaire consisted of 22 questions that tested for knowledge on causes and prevention of foodborne illnesses, signs and symptoms of food poisoning, aims of food safety and personal hygiene. Each question has options with one correct answer; a score of "1" was given for correct answer and a score of "0" for the wrong answer.

3.8.3. *PART 3: Food safety and hygiene practices*

The questions investigated practices such as how participants handle and store food, wash their hands and maintain good hygienic environment to avoid foodborne illness. Part 3 consisted of 11 questions; each question has options with one correct answer. A score of "1"was given for correct answer and a score of "0"for the wrong answer.

The data were collected from nine public hospitals within a period of 8 weeks. The questionnaires were handed to the participants to complete on their own, in the presence of the food service manager or food service supervisor, where there was no food service manager. The participants were given a period of 45 minutes to 2 hours to fill in the questionnaire while the researcher was waiting in the office of the food service manager in case problems were experienced, and the completed questionnaires were sent back to the researcher the same day. This arrangement of completing the questionnaire within 45 minutes to 2 hours and the questionnaires being sent back to the researcher was found to be less expensive, less time consuming than other alternatives and to produce quick feedback and results. The participants were given a brief explanation on the aim of the study before they commenced with filling in the questionnaire.

3.9. Data analysis

The knowledge questionnaire had 22 questions and the score range was between 0 and 22 (which was converted to 100 percent). The score below 50% of food safety knowledge was defined as poor knowledge, score above 50 as knowledgeable. Part 3 included 16 questions on practices of food service staff members and the score range was between 0 and 16 which were converted to 100 percent. The score below 50% was defined as poor practices, score below 50% as good practices.

Descriptive statistics were used to analyse the data received. The data were captured on an Excel spread sheet and exported to the Statistics Package of Social Science (SPSS) version 23 for analysis. Presentation of the results was in a form of percentages, counts/frequencies, and in a form of graph, table and charts. Chi-square tests were used to analyse associations

between variables, and odds ratios were calculated using logistic regression. The p-value below 0.05 indicated a significant association between variables. A statistician was consulted for assistance.

3.10. Validity

The validity of the questionnaire was verified by conducting a pilot study among 20 food service staff members at the Mokopane District Hospital Food Service Unit which has the same characteristics as the sample population in the study. Questions which were confusing to the participants were modified and those who participated in the pilot study did not form part of the final sample. The questionnaire was modified based on the comments collected from the pilot group. Also, the questionnaire was given to colleagues in the field of nutrition and food services for expert content validity.

3.11. Reliability

Reliability is a way of assessing the quality of the measurement procedure used to collect data in a dissertation (Salthouse & Hedden, 2002). In this study reliability was achieved by using a pre-validated questionnaire which was adapted to suit the study and modified based on the comments collected from the pilot study.

3.12. Ethical considerations

The approval to conduct research was obtained from the School of Health Sciences' Senior Degree Committee. The proposal was also submitted to the Medunsa Research Ethics Committee (MREC) for clearance, thereafter permission to collect data from various hospitals was granted from the Limpopo Department of Health and also from respective Chief Executive officers of hospitals where research was conducted. A standard University of Limpopo consent form (Appendix 2) was completed by each participant who agreed to take part in the study after a detailed explanation was provided. Participants' identification remained anonymous and confidentiality was maintained. Objectives and aim of the study were disclosed and fully explained to the managers for consent seeking before collecting data.

Participants had the right to decline or withdraw the invitation of taking part in the study with full respect and participation in the study was voluntary.

3.13. Significance of the study

Findings of the study may assist the food service managers and dietitians to come up with continuous training of food service staff on issues relating to food hygiene and food safety, eliminate constraints and challenges faced by the food service staff. It will also assist the Department of Health to review or develop provincial food safety policies, implementation strategies and to come up with a tool to monitor and improve standard of hygiene in the food service unit according to HACCP and to formulate guidelines to assist food service staff to meet food safety and food hygiene requirements.

3.14. Conclusion

This chapter discussed the methodology used in conducting the study. The study design, study area, study population, sampling, pilot study, data collection and ethical consideration were explained. Data collection further elaborated on reliability, validity and bias specifically focusing on sampling and information bias. The results of the study will be discussed in the next chapter.

CHAPTER 4: ANALYSIS OF RESULTS

4.1. Introduction

The purpose of this chapter is to present and interpret the empirical findings of this research. Eighty four (84) foodservice workers completed the questionnaires. The researcher required the respondents' personal information which included their age, gender, years of experience, level of education and work activity and they were also required to respond to questions relating to hygiene knowledge and practices.

4.2. Demographic information

The table below shows the age, gender, years of experience, education level, work activity and course attendance distribution of these food service staff members.

Table 4.1: Demographic data of the foodservice staff members

Characteristics	Demographic data	Frequency	Percent (%)
Age group	Not indicated	1	1
	Less than 20 years	1	1
	20 - 30 years	6	7
	30 - 40 years	21	25
	40 - 50 years	26	31
	Above 50 years	29	35
Gender	Female	50	60
	Male	34	40
Years of experience	Less than 5 years	14	17
	5 – 10 years	24	29
	11 – 15 years	17	20
	16 – 20 years	11	13
	21 – 25 years	3	4
	Above 25 years	15	18
Education level	Primary education	11	13

	Secondary education	34	40
	Matric/Grade 12	23	27
	Post matric	16	19
Work activity	Cook	48	57
	Scullery	14	17
	Cleaner	10	12
	Supervisor	11	13
	Other	1	1
Attended a course	Yes	69	82
	No	14	17
	Not indicated	1	1

As indicated in Table 4.1. above the largest group of food service staff were aged 50 years and above, there were more females (n = 50; 60%) than males (n = 34; 40%). The majority of staff members (n = 70; 83%) had more than five years' working experience in the foodservice section. Thirty four (40%) of them had secondary education, twenty three (27%) had matric/grade 12 and sixteen (19%) had obtained post matric education. The majority (n = 69; 82%) of the participants had attended a course on food hygiene and food safety while 17% (n = 14) had never attended any course.

The figure below shows work activity or job designation of food service staff.

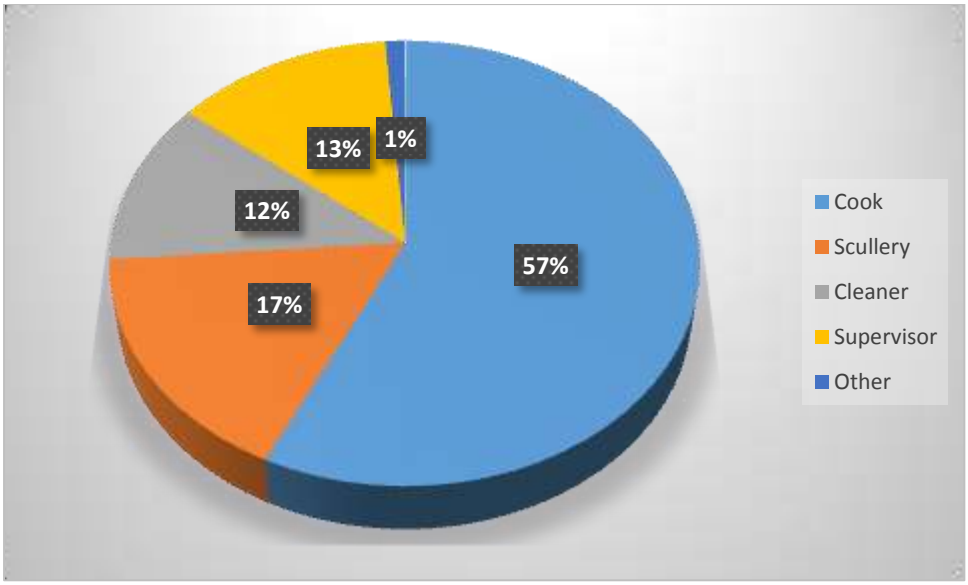


Figure 4.1: Job designation of food service staff

The participants were also evaluated according to their work activity in the food service unit and it was found that more than half (n = 48; 57%) were allocated as cooks responsible for preparation of the meals; 17% (n=14) of them were allocated at the scullery responsible for washing dishes and eleven (13%) were employed as food service supervisors, responsible for supervising food service aids. There was one (1%) student who was doing internship.

The figure below shows percentage of food service staff who attended a course on food safety and hygiene.

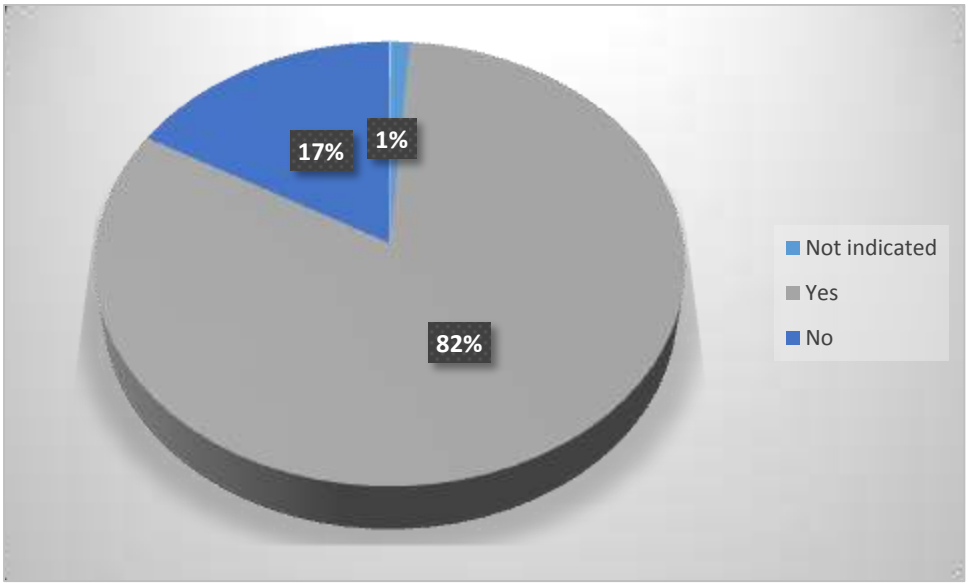
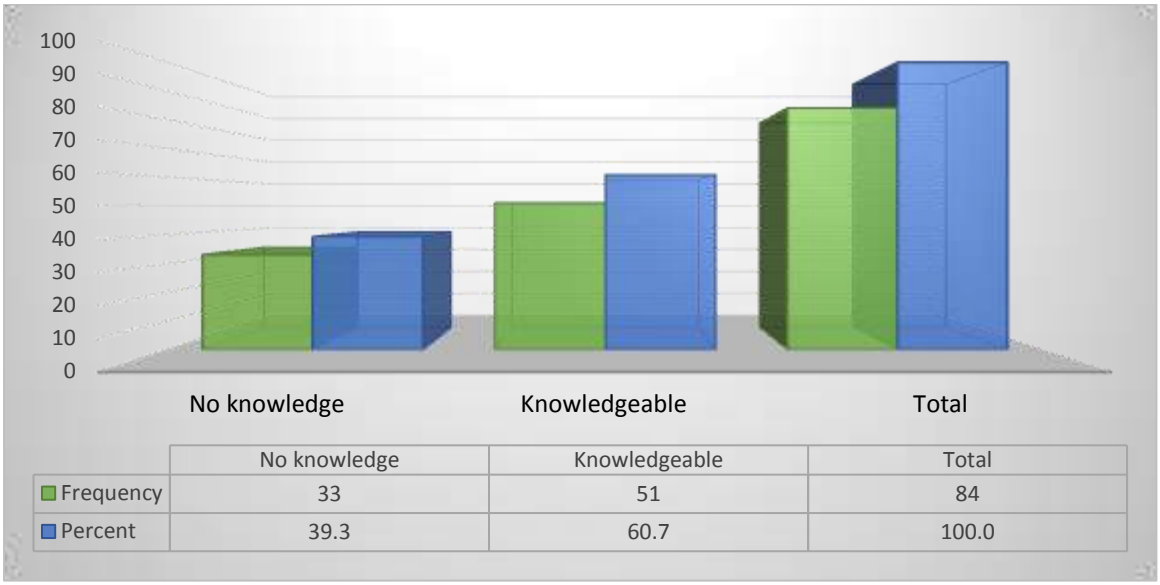


Figure 4.2: Foodservice staff members trained on food safety and hygiene

Figure 2 shows that the majority of food service staff members (n=69; 82%) have attended a course or training on food hygiene and food safety, while (n=14; 17%) have not attended one.

4.3. Food hygiene and food safety knowledge

The figure below shows knowledge level of food service staff regarding food hygiene and food safety.



	No knowledge	Knowledgeable	Total
Frequency	33	51	84
Percent	39.3	60.7	100.0

Figure 4.3: Knowledge level of food service staff regarding food hygiene and food safety

Based on figure 3, more than half (n = 51; 61%) of the staff members were knowledgeable regarding food safety and food hygiene, as compared to 33 (39%) who had poor knowledge.

The table below shows the responses given by the food service staff members regarding their knowledge about food hygiene and food safety.

Table 4.2: Staff member's responses to knowledge questions

In order for your clothing not to contaminate food you need to:		**Incorrect**	**Correct**
	N (%)		
Store personal belongings and clothing in food storage areas at the corner.	0	10 (12)	74 (88)
Change in the toilet.	4 (5)		
Store personal belongings and clothing in a locker or changing room	74 (88)		
All of the above	4 (5)		
Did not answer	2 (2)		
The difference between washing and sanitizing is:			

Washing removes contamination and sanitizing destroys microorganisms. Washing makes things look clean and sanitizing makes them smell good. Washing removes contamination and sanitizing whitens There is no difference Did not answer	31 (37) 25 (30) 19 (23) 4 (5) 5 (6)	65 (77)	19 (23)
If a food handler is sick with bad cold, fever and diarrhoea, he should: Wash hands before work Take medicine before going to work. Take adequate rest at home Not handle food until he receives medical clearance Did not answer	 14 (17) 4 (5) 38 (45) 27 (32) 1 (1)	57 (67.9)	27 (32.1)
To wash the vessels we can use: Bleach Detergent Pine gel None of the above Did not answer	 26 (31) 29 (35) 10 (12) 16 (19) 3 (4)	58 (69)	26 (31)
Which of the following symptoms make the food handler away from work place: Vomiting Fever Diarrhoea All of the above Did not answer	 4 (5) 2 (2) 4 (5) 73 (87) 1 (1)	11 (13)	73 (87)
The best way to destroy any harmful germs that may be present in food is to: Add salt to the food Keep food at room temperature Cook food to the right temperature Keep food below 5°C at all times Did not answer	 3 (4) 17 (20) 44 (52) 18 (21) 2 (2)	40 (48)	44 (52)
Who is responsible for safe and healthy food: Food service manager Food service staff Food service supervisor All of the above Did not answer	 4 (5) 8 (10) 6 (7) 64 (76) 2 (2)	20 (24)	64 (76)
If you have a cut on your hand, you must: Stay at home Continue working and hope that bleeding stops Stop the bleeding, cover it with bandage and wear non-latex gloves Keep your hand elevated to stop bleeding	 8 (10) 4 (5) 68 (81) 4 (5)	16 (19)	68 (81)

You can prevent foodborne illnesses by:			
Serving food without washing hands	5 (6)		
Washing hands, using gloves and keeping food at the right temperature	63 (75)	21 (25)	63 (75)
Hand washing once in a day	1 (1)		
Spraying pesticides on the kitchen floor once in a month so pets would not get in the food	13 (15)		
Did not answer	2 (2)		
Hand washing should be done:			
Before handling food	37 (44)		
After handling food	0 (0)	41 (49)	43 (51)
In between preparations	4 (5)		
All of the above	43 (51)		
The important measure to keep harmful germ away from food is to:			
Wash hands thoroughly and frequently and use gloves when necessary	60 (71)	24 (29)	60 (71)
Do not touch anyone other than food	8 (10)		
Remove all jewellery prior to working with food	8 (10)		
Use of hair net/caps before handling food	4 (5)		
Did not answer	4 (5)		
For drying hands after washing one must:			
Use a cotton wool	1 (1)		
Just shake excess water away	1 (1)	4 (5)	80 (95)
Use an air dryer	32 (38)		
Use a paper towel	48 (57)		
Did not answer	2 (2)		
Hands must be dried after washing in order to:			
Prevent dripping of water			
Prevent germs and bacteria which get spread with wet hands	12 (14)	58 (69)	26 (31)
Hold the utensils properly	26 (31)		
a and b	6 (7)		
Did not answer	37 (44)		
	3 (4)		
Food handlers requires knowledge on food hygiene:			
To reduce work place accidents such as cuts and burns	4 (5)		
To reduce the amount of food thrown away due to spoilage	10 (12)	32 (38)	52 (62)
To prevent the spread of illnesses through food	52 (62)		
To reduce the number of complaints from customers/patients	15 (18)		
Did not answer	3 (4)		
What are the signs and symptoms of food poisoning:			
Vomiting, Nausea	3 (4)		
Stomach ache	5 (6)	14 (17)	70 (83)
Diarrhoea	4 (5)		
All of the above	70 (83)		
Did not answer	2 (2)		
Foodborne infections occur when people eat:			
Poisons food	19 (22)		

Spicy food	1 (1)	26 (31)	58 (69)
Cold foods	4 (5)		
Contaminated food	58 (69)		
Did not answer	2 (2)		
Which of the following is true about the bacteria:			
Bacteria multiply and grow faster in warm environments	39 (46)		
Bacteria need air to survive	3 (4)	45 (54)	39 (46)
All types of bacteria leads to poisoning	26 (31)		
Freezing prevents transmission and multiplication of bacteria	15 (18)		
Did not answer	1 (1)		
Which of the following is important to prevent food poisoning:			
Thoroughly wash and dry hands	6 (7)	20 (24)	64 (76)
Never cough or sneeze over food or where food is prepared or stored	8 (10)		
Covering and tying hair.	4 (5)		
All of the above	64 (76)		
Did not answer	2 (2)		
Food hygiene includes:			
Hand washing	24 (29)		
Cooking	2 (2)	28 (33)	56 (67)
Serving	2 (2)		
All of the above	56 (67)		
Food hygiene is necessary for:			
Avoiding food poisoning	8 (10)		
Preparing healthy food	9 (11)	31 (37)	53 (63)
Preventing foodborne diseases	14 (17)		
All of the above	53 (63)		
Food poisoning is because of:			
Not washing hands properly	5 (6)		
Serving contaminated food	11 (13)	29 (35)	55 (65)
Touching ready to eat food with bare hands	10 (12)		
All of the above	55 (65)		
Did not answer	3 (4)		
Which of the following is a cause of foodborne disease:			
Unhygienic food	70 (83)	14 (17)	70 (83)
Hygienic food	6 (7)		
Properly cooked food	5 (10)		
Properly preserved food	3 (4)		

Almost all food service staff (n = 80; 95%) gave correct response on the question of drying hands with paper towel/air dryer after washing. Seventy four (88%) were aware that they need to store personal belongings and clothing in a locker or changing room. The majority of participants (n=73; 87%) were also knowledgeable about the symptoms that make the food handler stay away from the work place. Seventy (83%) of the food service staff were also

aware of the symptoms of food poisoning and the cause of foodborne diseases. However, participants lacked knowledge in the following areas: they (n=65; 77%) were not aware of the difference between washing and sanitizing; food service staff (n=57; 68%) lacked knowledge on the fact that a food handler who is sick with bad cold, fever and diarrhoea should not handle food until she or he receives medical clearance, whereas 58 (69%) had no knowledge about what to use to wash vessels and that hands must be dried after washing to prevent germs and bacteria which get spread with wet hands. Forty five (54%) were not aware that the statement which says bacteria multiply and grow faster in warm environments is true.

4.4. Demographic profile and knowledge of food service staff

The table below shows demographic information and knowledge level of food service staff regarding food hygiene and food safety

Table 4.3: Demographic information vs knowledge

	Knowledge		**P-value**
	Poor knowledge	**Knowledgeable**	
Gender			
Female	21 (25%)	29 (34%)	0.537
Male	12 (14%)	22 (26%)	
Total	33 (39%)	51 (60%)	
Age			
Not indicated	1 (1%)	0 (0%)	
Less than 20 years	0 (0%)	1 (1%)	
20-30 years	1 (1%)	5 (6%)	
30- 40 years	7 (8%)	14 (17%)	0.408
40 - 50 years	13 (15%)	13 (15%)	
Above 50 years	11 (13%)	18 (21%)	
Total	33 (39%)	51 (61%)	
Years of experience in Food Service Unit			
Less than 5 years	2 (2%)	12 (14%)	0.235
5 - 10 years	8 (10%)	16 (19%)	
10- 15 years	9 (11%)	8 (10%)	

15- 20 years	5 (6%)	6 (7%)	
20 - 25 years	1 (1%)	2 (2%)	
Above 25 years	8 (10%)	7 (8%)	
Total	33 (39%)	51 (61%)	
Education			
Primary education	6 (7%)	5 (6%)	
Secondary education	19 (23%)	15 (18%)	
Matric/Grade 12	6 (7%)	17 (20%)	0.016
Diploma	2 (2%)	8 (10%)	
Degree	0 (0%)	6 (7%)	
Total	33 (39%)	51 (61%)	
Work activity			
Cook	16 (19%)	32 (38%)	
Scullery	7 (8%)	7 (8%)	
Cleaner	7 (8%)	3 (4%)	0.155
Supervisor	3 (4%)	8 (10%)	
Other	0 (0%)	1 (1%)	
Total	33 (39%)	51 (61%)	
Attend course on food hygiene and food safety			
Not indicated	0 (0%)	1 (1%)	0.463
Yes	29 (35%)	40 (48%)	
No	4 (5%)	10 (12%)	
Total	33 (39%)	51 (61%)	

Table 4.3 shows that fewer (n=22; 26%) 22 out of 34 males participated in the study were knowledgeable as compared to 29 out of 50 females participants (n=29; 34%). The p-value (0.537) indicates that there is no correlation between gender and knowledge of food service staff. In this study more staff members 50 years and above (n =18; 21%) were considered knowledgeable as compared to the rest of the participants. Using Chi-square test the P-value is 0.408 which implies that there is no significant difference between age and knowledge.

Of all participants (n = 84; 100%), food service staff with 5 – 10 years' experience (n = 16; 19%) were more knowledgeable on issues relating to food hygiene and food safety, followed by those with less than 5 years' experience (n = 12; 14%), while those with 20 – 25 year experience had lowest percentage (n=2; 2%) of knowledgeable staff members, with P-value of 0.235.

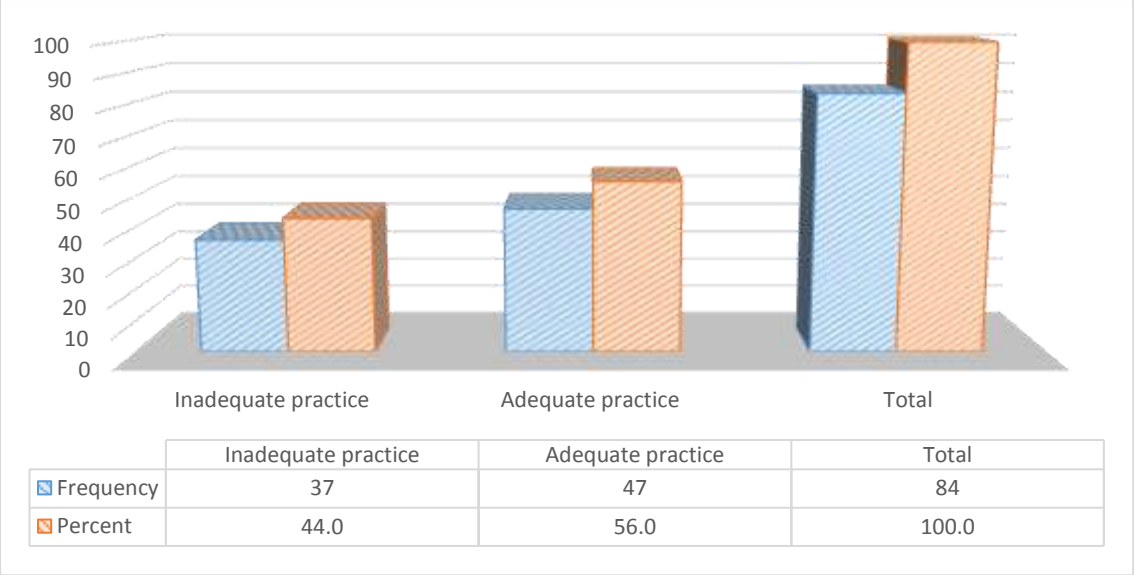
The table above shows that of the food service staff with primary education few participants (n=5; 6%) were knowledgeable regarding food hygiene and food safety as compared to those with matric/grade 12 (n=14; 17%), followed by those with secondary education (n=15; 18%) and those with post matric qualification (n =14; 17%), P-value is 0.016 which implies that there is significant correlation between level of education and knowledge.

The largest group of food service staff who were found to be knowledgeable on food hygiene and food safety were cooks (n= 32; 38%), followed by supervisor (n=8; 10%), staff allocated at scullery (n=7; 8%) and cleaner at 4% (3), with P-value of 0.155.

The results show that out of a total of 69 food service staff members who attended any course or training on food hygiene and food safety, 29 (35%) had poor knowledge while 40 (48%) were knowledgeable, and out of a total of 14 who did not attend any course or training (n=4; 5%) had poor knowledge while (n=10; 12%) were knowledgeable. The P-value is 0.463.

4.5. Food hygiene and food safety practices of food service staff

The figure below shows information on food safety and hygiene practices of food service staff in Capricorn district Limpopo.



	Inadequate practice	Adequate practice	Total
Frequency	37	47	84
Percent	44.0	56.0	100.0

Figure 4.4: Food hygiene and food safety practices of food service staff

The figure shows that n = 47 (56%) of the food service staff had adequate practices, while n = 37 (44%) indicated inadequate practices. Results of the study conducted indicate that more than half of the participants had adequate food hygiene and food safety practices.

In general, the food service staff had good hygiene practices such as thoroughly washing their hands with warm water and soap for at least 20 seconds before handling food items. Many of them heat leftovers (n=78; 93%) and precautions are taken when preparing cooked and raw food (n=62; 74%).

The table below shows responses of food service staff on food hygiene and food safety practices.

Table 4.4: Staff member response to hygiene and safety practices questions

		Incorrect	**Correct**
	n (%)	**n (%)**	**n (%)**
Which one step do you follow for washing hands:			
Rinse, wash, sanitize and air dry	5(5.6)	54 (64)	30 (36)
Sanitize, wash, rinse, pre-scrape and towel dry	27(32.1)		
Wash, rinse, towel dry and sanitize	21(25.0)		
Pre-scrape, wash, rinse, sanitize and air dry	30(35.7)		
Did not answer	1		

Which temperature do you maintained for potentially hazardous food that has been cooked and needs to be reheated:			
Re-heat to 54°C in a steam table or other hot holding equipment	22 (26)	69 (82)	15 (18)
Re-heat at 63°C or hotter	15 (18)		
Re-heat slowly in the oven to 68°C, stirring at least twice.	28 (33)		
Re-heat quickly to 73°C or hotter	15 (18)		
Did not answer	4 (5)		
The best way you use to control cockroaches, mice, flies and other pests is to:			
Apply pesticide everyday			
Just sweep the floor	12 (14)	26 (31)	58 (69)
Pour chlorine in the sink drain	8 (10)		
Keep the establishment and garbage area clean, and eliminate hiding places and routes of entry	6 (7)		
	58 (69)		
What do you do before handling food item:			
Start food preparation	3 (4)	9 (11)	75 (89)
Wash hands thoroughly with warm water and soap for at least 20 seconds	75 (89)		
Take the clean dishes out of the dishwasher	4 (5)		
Rinse off hands quickly	2 (2)		
Best way you use to control contamination is to:			
Keep the floor and walls clean	8 (10)	25 (30)	59 (70)
Cool down hot food quickly	2 (2)		
Wash hands as often as necessary and do not touch ready-to-eat food with bare hands	59 (70)		
Keep hot food hot and cold food cold	14 (17)		
Did not answer	1 (1)		
How frequently do you wash your hands			
Every 30 minutes	28 (33)	31 (37)	53 (63)
When your supervisor tells you	1 (1)		
When the customers/patients can see your hands	2 (2)		
Each time your hands or gloves become contaminated	53 (63)		
Are you allowed to work in the kitchen, if you have a contagious illness:			
Yes	2 (2)		
It depends on the type of the contagious illness	20 (24)	82 (98)	2 (2)
Never	54 (64)		
Only if no one can tell you are sick	2 (2)		
Did not answer	4 (5)		

Which of the following food will you not touch with bare hands: The garbage Food crates Ready-to-eat food Spoiled food Did not answer	 17 (20) 10 (12) 20 (24) 36 (43) 1 (1)	64 (76)	20 (24)
The safest way you use to thaw (defrost) food is to: Keep container at room temperature Sink with hot running water Sink at room temperature over night Keep in the refrigerator	 24 (29) 13 (15) 24 (29) 23 (27)	61 (73)	23 (27)
You wash your hands only in: Any sink that is free and accessible An authorized and designated hand washing sink An authorized hand sink or in the dish wash sink if the hand sink is not working The sanitizer bucket	 5 (6) 65 (77) 11 (13) 3 (4)	19 (23)	65 (77)
Where do you store cleaning items and sanitizers: Away from food items or clean equipment and utensils At least 15cm above the floor With equipment's and cleaning utensils On the shelf above food and utensils Did not answer	 40 (48) 4 (5) 33 (39) 6 (7) 1 (2)	51 (61)	33 (39)
Which of the following jewellery is acceptable for you to wear: Necklace Arm ring Bracelet None of the above Did not answer	 3 (4) 5 (6) 1 (1) 74 (88) 1 (1)	10 (12)	74 (88)
How many times can you reheat leftovers: As many times as you like Twice Four times You should only reheat leftovers once	 1 (1) 3 (4) 2 (2) 78 (93)	6 (7)	78 (93)
Which of the following did you ever substitute for proper hand washing: Hand sanitizers Tissue paper Gloves I never substituted proper hand washing	 39 (46) 4 (5) 21 (25) 20 (24)	64 (76)	20 (24)

Which of the following do you avoid in your workplace (kitchen):			
Hand washing	12 (14)	31 (37)	53 (63)
Touching nose and ear	53 (63)		
Wearing cap and gown	3 (4)		
All of the above	13 (15)		
Did not answer	3 (4)		
What precaution do you take when you prepare cooked and raw food:			
I use same kitchen utensils to prepare cooked and raw food	9 (10)	22 (26)	62 (74)
I use separate kitchen utensils to prepare cooked and raw food.	62 (74)		
There is no need to take precaution when I prepare cooked and raw food.	8 (10)		
I only take precautions when my supervisor tells me to.	4 (5)		
Did not answer	1 (1)		

4.6. Demographic profile and practices of food service staff

The table below shows the demographic data of food service staff and practices on food hygiene and food safety.

Table 4.5: Demographic information vs practice

	Practice		P-value
	Inadequate practice	**Adequate practice**	
Gender			
Female	21 (25%)	29 (35%)	0.647
Male	16 (19%)	18 (21%)	
Total	37 (44%)	47 (56%)	
Age			
Not indicated	1 (1%)	0 (0%)	
Less than 20 years	0 (0%)	1 (1%)	
20-30 years	4 (5%)	2 (2%)	
30- 40 years	10 (12%)	11 (13%)	0.575
40 - 50 years	10 (12%)	16 (19%)	
Above 50 years	12 (14%)	17 (20%)	
Total	37 (44%)	47 (56%)	
Years of experience in Food Service Unit			
Less than 5 years	6 (7%)	8 (10%)	
5 - 10 years	10 (12%)	14 (17%)	
10- 15 years	8 (10%)	9 (11%)	0.689
15- 20 years	3 (4%)	8 (10%)	
20 - 25 years	1 (1%)	2 (2%)	
Above 25 years	9 (11%)	6 (7%)	
Total	37 (44%)	47 (56%)	

Education Primary education Secondary education Matric/Grade 12 Diploma Degree Total	 3 (4%) 21 (25%) 8 (10%) 5 (6%) 0 (0%) 37 (44%)	 8 (10%) 13 (15%) 15 (18%) 5 (6%) 6 (7%) 47 (56%)	0.024
Work activity Cook Scullery Cleaner Supervisor Other Total	 22 (26%) 6 (7%) 8 (10%) 1 (1%) 0 (0%) 37 (44%)	 26 (31%) 8 (10%) 2 (2%) 10 (12%) 1 (1%) 47 (56%)	0.021
Attend any course on food hygiene and food safety Not indicated Yes No Total	 0 (0%) 31 (37%) 6 (7%) 37 (44%)	 1 (1%) 38 (45%) 8 (10%) 47 (56%)	0.665

According to the table above more females (n= 29; 35) had adequate food hygiene and food safety practices than males (n= 18; 21%). The P-value is 0.647, which implies that there is no significant correlation between gender and practice.

The influence of the age of food service staff on food hygiene and food safety practice on table 4.5, indicate that food service staff above the age 50 years (n=17; 20%) had adequate practices, followed by the age group 40 – 50 years (n=16; 19%) then age group 30 – 40 years (n=11; 13%) and age groups 20 – 30 years and less than 20 years at 2% and 1% respectively. Using Chi-square test the P-value is equal to 0.575 which implies that there is no significant correlation between age and practice.

Regarding practices of food service staff and years of experience, those with 5 – 10 years of experience had most adequate practice (n=14; 17%), followed by those with 10 – 15 years of experience (n=9; 10.7%). Food service staff with less than 5 years and 15 – 20 years of experience had same number/percentage n=8; 10%) of food service staff with adequate practice, whereas those with above 25 years and 20 – 25 years had a low number/percentage of food service staff with adequate practices, 6% and 2% respectively. Chi-square test shows that there was no significant difference (0.689); therefore there was no correlation between years of experience and practice.

The above table (Table 4.5) indicates that food service staff with matric or grade 12 (n=15; 18%) had adequate food hygiene and food safety practices, followed by those with secondary education (n=13; 15) and post matric qualification with (n=11; 13%). Those with primary education, only (n=8; 10%) had adequate practices on food hygiene and food safety. Using the Chi-squared test, P-value is 0.024 which implies that there is a significant difference between education and practice.

Table 4.5 indicates that the cooks (n=26; 31%) had the most adequate food hygiene and food safety practices as compared to supervisors (n=10; 12%), then followed by staff allocated at scullery (n=8, 10%) and cleaners with n=2 (2%). The P-value is 0.021, which indicate that there is significant difference between knowledge and job designation.

When answering questions on food hygiene and food safety practices, out of a total of 69 food service staff who attended any course or training on food hygiene and food safety 31 (37%) food service staff members showed inadequate practices on food hygiene and food safety as compared to 38 (45%) who showed adequate practices. Out of those who did not attend any course or training (14), 6 (7%) showed inadequate practices as compared to 8(10%) who showed adequate practices. The P-value is 0.665 which implies that there is no association between attending course and practice.

4.7. Correlation between knowledge and practices of food service staff

The table below shows the influence of knowledge on food hygiene and food safety practices of food service staff.

Table 4.6: Influence of Knowledge on Practices

Knowledge		Practice		
		Inadequate practice	Adequate practice	Total
	No knowledge	19 23%	14 17%	33 39%
	Knowledgeable	18 21%	33 39%	51 61%
Total		37 44%	47 56%	84 100%

Table 4.6 shows the results of cross tabulation used to identify if knowledge have influence on the practices of food service staff regarding food hygiene and food safety. Of all food service staff members, who were regarded as knowledgeable (n=51; 61%), 33 had adequate food hygiene and food safety practices as compared to n=18 from the same group, who did not. And of those who had no knowledge (n=33; 39%), 19 had inadequate food hygiene and food safety practices as compared to 14 from the same group. Using the Chi-square test P-value is 0.045 which is too close to the critical value (0.05).

4.8. Conclusion

In this chapter an analysis of data was made based on standards and the requirements prescribed by food safety and food hygiene legislation. The analysis further focused on demographic characteristics, food safety and food hygiene knowledge, and food hygiene and food safety practices. The chapter further highlighted food safety and food hygiene knowledge from various food service establishments and legislations, and food hygiene and food safety practices in place. The knowledge and practices were compared to the standards and requirements prescribed by food safety legislation to determine the progress and the level of compliance as required by Policy for food service management in public establishments, by RSA Department of health, 2010.

CHAPTER 5

DISCUSSION OF RESULTS

5.1 Introduction

This chapter provides an overview of the researcher's results. The chapter further discusses the results, provides conclusion to this study and presents recommendation based on the results.

5.2. Demographic profile

The knowledge of food hygiene and food safety practices of food service staff play a major role in the incidence of foodborne diseases which are a widespread public health problem in both developing and underdeveloped countries (Sanlier, 2009; Sanlier, 2010).

Sixty percent of food service staff working in the Capricorn district hospitals are women. Similarly, Green et al. (2005) found that there were 280 (52.9%) females and 206 (47.1%) men employed in chain or independent restaurants and institutions. Martins, Hogg & Otero et al. (2012) also found a higher percentage of women (96%) than men (4%) in their study among about food handlers in a catering company in Portugal. This suggests that the majority of workers in the catering business are women.

In this study the largest group (35%) of participants were above 50 years of age. This is different from other studies where the majority of the participants were a bit younger aged between 25 to 30, 31 to 50 and 31 to 40 years, respectively (Abdelhafez, 2013, Angelillo, Viggiani, Greco, et al., 2001, Tokuc et al., 2009). The majority of food service staff in this study had secondary school education and matric or grade 12 (40% and 27%), respectively. This was also the case in the study by Acikel, Ogur, Yaren et al. (2008) on hygiene training of food handlers at teaching hospitals in Gulhane Military Medical Academy, Department of Public Health.

Out of 84 participants in this study, the majority (n = 48; 57%) were cooks, and 17% (n = 14) were stationed at the scullery (working in dishwashing area). The same was observed in a study by Sneed, Strohbehn & Gilmore et al. (2004) on food safety practices and readiness to

implement HACCP programs in assisted living facilities in Iowa, where 87 (53%) of participants were cooks and also in a study by Acikel et al. (2008) where 56% (n=44) participants worked as chefs/cooks and 12% were in the dishwashing area.

The majority of participants in this study had more than 5 years working experience in the food service unit, compared to participants in a study by Angelillo et al. (2001) where majority of the participants had more than 10 years' experience. More than two third (69%) of the food service staff in this study had previously attended a course on food hygiene and food safety practices. This is different from the study by Buccheri et al. (2007), where more than 80% of food handlers did not attend any educational course on food hygiene.

5.3. Food safety and hygiene knowledge among foodservice staff members

The results show that of all the 84 food service staff members who participated in this study, fifty one (67%) were knowledgeable. Similar findings were reported in the study by Siow and Sani (2011) where knowledge level of food handlers at the two residential cafeterias and a canteen was moderate, with a mean value of 57.8%. Annor and Baiden (2011) also reported satisfactory level of knowledge of food hygiene on studied food handlers in food businesses in Accra, Ghana.

On the other hand, a study that was performed in small and micro-enterprises, to assess food handlers' knowledge on food hygiene (n = 159) in the proximity of the Tygerberg Academic Hospital, Western Cape, South Africa (Marais et al., 2007) reported lower findings where the average percentage of correct answers was 46%. It is important that food service staff members are aware of food safety and food hygiene principles as this forms the cornerstone of prevention of foodborne illnesses and they also play an important role in ensuring food safety throughout the chain of production, processing, storage, preparation and serving of food hence their knowledge regarding the same should be of highest concern (Zain & Naing, 2002). However, whether this knowledge is transferred into practice remains a challenge (Tan et al., 2013) and will be discussed under section 5.6 later.

5.4. Knowledge vs demographic characteristics of the foodservice staff members

Pearson's correlation studies were done to determine whether there was any statistically significant association between knowledge and age, gender, work activity, educational level, course attendance as well as years of experience. Although knowledge seemed to increase

with age, the p-value (0.408) indicates that the association is statistically insignificant meaning that age did not influence knowledge among the foodservice staff members.

Siow & Sani (2011) report a significant relationship between the level of knowledge of food handlers at residential colleges and a canteen in the main campus of University of Kebangsaan, Malaysia and their working experience (p-value = 0.008) which is different from the results of the current study. In this study years of experience had no influence in knowledge of food service staff as indicated by a p-value of 0.235.

More staff members who attended training on food safety and hygiene were more knowledgeable than those who never attended any course. However, the difference was not statistically significant as indicated by a p-value of 0.463, indicating that there is no association between previous training and level of knowledge. This is contrary to a study by Sharif et al. (2013) which found that the level of knowledge was influenced by training of food handlers in Jordanian Millitary Hospitals. Similarly El Derea, Salem, E, Fawzi et al. (2008) found significant differences in the mean score percentages of all the different knowledge parameters in both hospitals after training and in an improvement in their overall food safety knowledge. Even though the difference was statistically insignificant in the current study, there was however a difference observed, which indicates the possibility of improved knowledge with training.

The only statistically significant association (p-value = 0.016) was identified between educational level and knowledge. More knowledge was reported among the participants with matric/grade 12, secondary education and those with post matric qualification - 17 (20%) and 15 (18%) - than among those who only went up to primary school (n = 4; 5%). Our findings are consistent with those of other studies in which education level was associated with a better performance of the respondents in the knowledge section (Buccheri et al., 2010, Jianu & Chris, 2012, Sharif et al., 2013). Different findings were however reported by Abdul-Mutalib, Abdul-Rashid, Mustafa et al. (2012), who found no significant difference in food handlers' food hygiene and sanitation knowledge compared to their education level.

5.5. Food safety and hygiene practices among foodservice staff members

The current study showed that 56% of the participants had adequate hygiene and safety practices. The same was observed in a study by Kasturwar & Mohd. Shafee (2011), reports

that practice of food handlers was satisfactory. Bas et al. (2006) reported relatively poor practices among the studied respondents, their results showed that food safety practice score of hospital food services was 50.9 ± 9.2.

Even though the results indicate that participants had adequate practice, the total percentage of those with adequate practice was not satisfactory. Poor hygiene practices can result in foodborne illnesses; therefore the other 44% pose a huge risk to hospitalised patients.

5.6. Practices vs demographic characteristics of the foodservice staff members

Education and work activity were significantly associated to adequate practice, with p-value 0.026 and 0.021, respectively. Similar findings were reported in food hygiene knowledge, attitude and practices of food handlers in the Military Hospitals study by Sharif et al. (2013), where they reported that practice scores were significantly ($p < 0.05$) affected by the level of education and by the type of work (cooks and nutritionist practice scores were similar). A study by Buccheri et al. (2010) reports different results. They claim that the education level category was inversely associated with good practice especially the practice about the need for separating raw from cooked foods.

No associations ($p < 0.05$) were found between practice and age, gender, years of experience and course/training attendance with p-values 0.0575, 0.647, 0.689 and 0.463 respectively. On the contrary, a study to investigate knowledge, attitudes and self-reported practices of food service staff in nursing homes and long-term care facilities showed significant differences in respondents' practices as influenced by age, length of service in the employment, education and attending training courses on food hygiene (Buccheri et al., 2010). Overall, studies on food safety knowledge and practices are inconsistent with regard to the relationship between demographic characteristics and knowledge or practices.

5.7. Food safety knowledge and practices of foodservice staff members

Improper food handling is a major cause of foodborne diseases and poor hand hygiene is one of the major risk factors in the occurrence of food contamination (Codex Alimentarius Comission, 2003). Unsafe food handling practices in food service establishments are a major contributor to the transmission of foodborne illnesses (Mitchell, Fraser & Bearon, 2007). Food handlers should always wash their hands at every stage of food production, particularly

before handling foods, after eating, after touching contaminated materials and after using the bathroom (The National Restaurant Association Educational Association, 2012)

When questioned about what they do before handling food, 89% (n= 75) of the food service staff members answered that they wash hands thoroughly with warm water and soap for at least 20 seconds (Table 4.4). It is recommended that staff members thoroughly wash their hands with warm soapy water for at least 20 seconds before handling food (The National Restaurant Association Educational Association, 2012). Surprisingly, others (4% and 5%, respectively) said they just start with food preparation or take clean dishes out of the dishwasher without washing their hands while others (n = 2; 2%) said that they just rinse off hands quickly before handling food.

Several inadequate food hygiene and food safety practices were identified in this study. Almost all (n = 82; 98%) of the food service staff displayed inadequate practices relating to working in the kitchen if one has a contagious illness (Table 4.4). Table 4.4 indicates that 64 (76%) of the food service staff members were not aware that they cannot touch ready-to-eat food with bare hands. Some of the staff members said that they sometimes substituted proper hand washing with using hand sanitizers, wiping with tissue paper or wearing gloves (Table 4.4). This is a cause for concern as food service workers can potentially contaminate food that is meant for patients' consumption, resulting in foodborne illnesses.

There is greater danger of bacterial growth and food spoilage for food thawed at room temperature. The best way to safely thaw meat and poultry is in the refrigerator (United States Department of Agriculture, 2006). More than half (n=45; 54%) of the participants in the current study were not aware that bacteria multiply and grow faster in warm environments (Table 4.2) and 61 (73%) of them, when asked a question on the safest way they use to thaw (defrost) food, answered incorrectly (Table 4.4).

It is also important for foodservice staff members to know how to handle leftover food as leftovers can also harbour pathogenic bacteria if not handled properly. The majority of participants (n = 78; 93%) responded correctly that leftovers should only be reheated once and different findings were reported by Marais et al. (2007), where 84.9% of food handlers ignored the right way of reheating food. More than three quarters (69%) of participants did not know which temperature to maintain for potentially hazardous food that has been cooked

and needs to be re-heated. In a study by Annor and Baiden (2011) 71% of the participants reported that the temperature at which uneaten foods that must be reheated should be above sixty degrees Celsius.

Jianu & Chis (2012) states that hand washing compliance is the single most important practice to avoid foodborne outbreaks while hairnet and jewellery usage are important practices to avoid physical contamination in food products that could become possible hazards to consumers. From the results of this study 54 (64%) could not answer correctly when asked about the right procedure they follow for washing their hands (Table 4.4). In the study conducted by Jianu & Chris (2012) it was also found that among the three groups (production, catering and retail) of food handlers studied, there was a significant number of respondents who did not know all the steps for proper hand washing (p-value 0.022). To the question of where hands should be washed, more than three quarter (77%) of participants were aware that hands should be washed in an authorized and designated hand washing sink.

In this study the majority (n = 74; 88%) were aware that jewellery is not acceptable to be worn in the food preparation area. Giritlioglu et al. (2011) also found that 84% of those surveyed in their study removed their jewellery before processing foods.

Overall, the staff members did well in most of the knowledge questions asked and generally n = 47 (56%) had adequate food hygiene and food safety practices as compared to n = 37 (44%) who had inadequate practices. The results show that 62 (74%) of the participants took precaution when preparing cooked and raw food by using separate kitchen utensils and 59 (70%) said another way to control contamination is to wash hands as often as necessary.

Almost all the food service staff (n = 80; 95%) answered correctly that after washing hands one must dry them with a paper towel/air dryer. Using a paper towel or air drying is one of the preventative measures that could be taken by food service staff to prevent food poisoning and it is thus incumbent upon the food service managers to provide their staff members with such. Seventy (83%) of the food service staff were also aware of the symptoms of food poisoning and the causes of foodborne diseases but more than two-thirds (n=57; 68%) of them lacked knowledge on the fact that a food handler who is sick with bad cold, fever and diarrhoea should not handle food until he or she receives medical clearance.

However, participants lacked knowledge in the following areas: they were not aware of the difference between washing and sanitizing (n = 65; 77%). The food service staff members were expected to know the difference so that they do not replace hand washing with sanitizing, as it is known that hand washing with soap and warm water is the single most effective way to prevent the spread of bacteria and viruses which are the major cause of foodborne illnesses. Viruses such as the norovirus are a concern in food service settings; it is the leading cause of foodborne outbreaks and sanitizers do not kill norovirus. Sixty nine percent (n = 58) of the participants had poor knowledge about what to use to wash vessels and that hands must be dried after washing to prevent germs and bacteria which get spread with wet hands.

5.8. Correlation between food safety and hygiene knowledge vs practice

In this study, out of the 51 food service staff members who were knowledgeable, thirty three had adequate practices. There was significant association between knowledge level and practices (p-value 0.045) meaning that being knowledgeable was associated with adequate practice. The study by Abdul-Mutalib et al. (2012) also shows a significant relationship between knowledge and practice level with a p-value of 0.034. In their study logistic regression predicted that the odds of getting poor practice level are 15.4 times higher for respondents with acceptable knowledge level than they are for respondents with excellent knowledge level.

The finding of this study contradicts the study by Bas et al. (2006) who found that good knowledge on food safety does not necessarily lead to good handling practices. The study by Abdelhafez (2013) also reveals a discrepancy between stated knowledge and practices for routine protective measures, suggesting that knowledge alone is probably insufficient to promote safe behaviour.

5.9. Conclusion

The objectives of the study were reviewed after the results and discussion to determine whether they were met or not. The **first objective** was to determine demographic characteristics of the food service staff in the public hospitals of the Capricorn district, Limpopo province. On the demographic characteristics most food service staff (60%) were

females while (40%) were males, 83% had more than five years working experience and 40% of food service staff had secondary education.

The **second objective** was to determine the knowledge of food service staff regarding food hygiene and food safety in the public hospitals of the Capricorn district, Limpopo province. The results on knowledge showed that 61% of food service staff members were knowledgeable regarding food safety and food hygiene as compared to 39% who had poor knowledge.

The **third objective** was to determine the practices of food service staff with regard to food hygiene and food safety in the public hospitals if the Capricorn district, Limpopo province. The results on practices showed that 56% of food service staff had adequate practices as compared to 44% who had inadequate food hygiene and food safety practices.

The **fourth objective** was to determine the association between demographic profile and knowledge and practices of food service staff in the public hospitals of the Capricorn district, Limpopo province. The results for knowledge showed that there was no correlation between gender and knowledge, and there was no significant difference between age and knowledge. There was significant correlation between level of education and knowledge with P-value of 0.016. The results for practices showed no significant correlation between gender and practice, age and practice and also between years of experience and practice. There was a significant difference between education and practice with P=-value 0.024 and there was also a significant difference between food hygiene and food safety practices knowledge and job designation with P-value 0.021.

The **fifth objective** was to determine association between knowledge and practices of food service staff in the public hospitals in the Capricorn district, Limpopo province. The results showed that out of 61% of food service staff regarded as knowledgeable 39% had adequate food hygiene and food safety practices and out of 39% with poor knowledge 23% had inadequate food hygiene and food safety practices as compared from 17% from the same group.

The study concluded that majority of food service staff in the public hospitals in the Capricorn district were knowledgeable on food safety and food hygiene, even though some were found lacking in other areas. Majority of participants showed adequate food hygiene and food safety practices even though the number was not satisfactory. There was a positive association between knowledge and practices of food service staff.

CHAPTER 6: SUMMARY AND CONCLUSION

The results of this study demonstrate that the majority of the participants were knowledgeable on food safety and hygiene. More knowledge was found in the area of using an air dryer or paper towel for drying hands after washing, symptoms that make the food handler be away from work place (vomiting, fever and diarrhoea), signs and symptoms of food poisoning and that unhygienic food may cause foodborne diseases. The participants were found lacking in areas such as differentiating between washing and sanitizing, the fact that food handlers who are sick with bad cold, fever and diarrhoea should not handle food until they receive medical clearance, what to use to wash vessels, reason why hands should be dried after washing. This indicates a need for training in these areas.

Knowledge was only significantly associated with education level of food service staff indicating a need to consider education level when employing staff to work in public hospital food service unit and also to provide continuous training regarding food hygiene and food safety to food service staff. Better knowledge, although not statistically significant, was reported among those food service staff members who previously attended the food safety and hygiene course/training. This implies that there are some benefits in attending training courses geared at improving knowledge.

The majority of participants showed adequate food hygiene and food safety practices, even though the number was not satisfactory. Adequate practices were reported in the following areas: number of times one can reheat leftovers, jewellery (necklace, arm ring and bracelet) that is not acceptable to be worn in a food service unit and that hands are washed only in an authorised designated hand washing sink. Participants were found lacking in areas such as if one is allowed to work in the kitchen if they have a contagious illness, temperature to maintain for potentially hazardous food that has been cooked and needs to be reheated, washing hands thoroughly with warm water and soap for at least 20 seconds before handling food item and the step / procedure followed for washing hands. This indicates a serious need for training in these areas, especially in hand washing as it is identified as the most common practice that can result in food contamination if not done properly (Jianu & Chris, 2012).

Practice was only significantly associated with education level and work activity of food service staff, indicating the need to consider education level of food service staff during employment processes and continuous training to employed staff in the food service units. A

positive association was found between the food service staff members' knowledge and practice. This strongly suggests that improving knowledge among these staff members could result in improved practices in the food service industry.

This study demonstrated that even if participants were knowledgeable, future food hygiene and food safety training should not focus on knowledge alone but also on why the practice should change. Training programs should be brief and focus on the needs of food service staff. As reported in previous studies on hospitals, there is a need for continuous training and for alternative educational strategies (Angelillo et al., 2001, Buccheri et al., 2007). The results of this study can form part of the basis of officially or legally implementing HACCP and may also influence skills and requirements needed for one to be employed as a food service aid in a hospital setting. The results may also assist in coming up with or implementing a monitoring tool or guideline to check if hospital food service units and personnel comply with the requirements for good hygiene practices.

6.1. Contribution of the study

The researcher believes that the findings of the study will assist the nutrition directorate or managers as food hygiene and food safety legislation implementers to know some of the gaps in terms of knowledge and practice faced by food service units' personnel in the Capricorn District, Limpopo Province. This will enable the food service managers and dietitians to plan appropriate training modules for their staff.

6.2. Recommendations

The results of the study may assist the Department of Health to take food service units seriously and thereby provide support and resources needed by food service staff to ensure that food service units comply with principles of food hygiene and food safety, as neglecting these principles can lead to increased morbidity and mortality. The results may help food service managers and hospital management to take appropriate measures to reduce the spread of foodborne illnesses; they may thereby also increase personnel knowledge through continuous training on food hygiene and food safety. Maintaining food safety and food hygiene knowledge is important and improvements in food safety and hygiene practices may be achieved through on-site training, management support, inspections, removal of perceived

barriers and co-worker peer pressure (Howells, Roberts, Shanklin et al., 2008, Seaman & Eves, 2006, Todd, Greig, Michaels et al., 2010). Future studies should further research on the knowledge and practices of food service staff in hospital food service units and also look at the attitude of the staff to quantify the magnitude of the level of knowledge and practices of food service staff in hospitals.

The results of this study cannot be extrapolated and generalised to other contexts and districts, taking into consideration of the sample size which was small and only covered a small area of the Limpopo Province.

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"http: //www.who.int/Food safety".

APPENDIX A

UNIVERSITY OF LIMPOPO
Medunsa Campus

MEDUNSA RESEARCH & ETHICS COMMITTEE

CLEARANCE CERTIFICATE

MEETING:	**07/2014**
PROJECT NUMBER:	**MREC/HS/273/2014: PG**

PROJECT:

Title:	Knowledge and practices of food service staff regarding food safety and food hygiene in the public hospitals in Capricorn district Limpopo province, South Africa
Researcher:	Ms D Mashuba
Supervisor:	Ms MM Bopape
Co-supervisor:	Mr MP Kekana
Department:	Medical Science, Public Health & Health Promotion
School:	Health Sciences
School:	Health Sciences
Degree:	MPH

DECISION OF THE COMMITTEE:

MREC approved the project.

DATE: 04 September 2014

UNIVERSITY OF LIMPOPO
Medunsa Campus
2014 -09- 04
MEDUNSA RESEARCH ETHICS COMMITTEE
MREC CHAIRPERSON

PROF GA OGUNBANJO
CHAIRPERSON MREC

The Medunsa Research Ethics Committee (MREC) for Health Research is registered with the US Department of Health and Human Services as an International Organisation **(IORG0004319)**, as an Institutional Review Board **(IRB00005122)**, and functions under a Federal Wide Assurance **(FWA00009419)**
Expiry date: **11 October 2016**

Note:
i) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.**
ii) **The budget for the research will be considered separately from the protocol.**
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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APPENDIX B

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

3006 Zone 2
Seshego
0742
23 October 2014

TO: The Head of Department
Department of Health
18 College Street
Polokwane
0699

Dear Sir/Madam

REQUEST FOR PERMISSION TO CONDUCT RESEARCH

My name is Dorcus Mmaphefo Mashuba and I am a Master's student at the University of Limpopo; Student No: 9641319 doing Masters in Public Health. The research I wish to conduct for my Master's dissertation is ''Knowledge and practices of food service staff regarding food safety and food hygiene in the capricorn district hospitals limpopo province''. This project will be conducted under the supervision of Mrs M M Bopape from the University of Limpopo.
The objectives of the research include the following:

- To determine the demographic characteristics of the food service staff in the public hospitals in Capricorn District.
- To determine the knowledge of food service staff regarding food hygiene and food safety.
- To determine the practices of food service staff with regard to food hygiene and safety.
- To determine the association between demographic profile, knowledge and practice.
- To determine the association between knowledge and practice of food service staff in the public hospitals in Capricorn District.

I am hereby seeking your consent/approval to conduct the study at Capricorn District Hospitals. I have provided you with a copy of my proposal as well as the consent forms and questionnaires to be used in the research process. Upon completion of the study, I undertake to provide the Department of Health with a copy of my full research report. If you require further information, please do not hesitate to contact me on Cell: 082 712 9998, Email maphefom@webmail.co.za, or Dorcus.Mashuba@dhsd.limpopo.gov.za.
Thanking for your time and consideration in this matter.

Yours sincerely

_____

D M Mashuba (University of Limpopo)

APPENDIX C

INFORMED CONSENT

PARENTS/GUARDIANS CONSENT FORM
(For each parent/guardian, please read and understand the document before signing)

RESEARCH TITLE

KNOWLEDGE AND PRACTICES OF FOOD SERVICE STAFF REGARDING FOOD SAFETY AND FOOD HYGIENE IN THE CAPRICORN DISTRICT HOSPITALS IN LIMPOPO PROVINCE, SOUTH AFRICA INTRODUCTION

This is an invitation to participate in the study as a volunteer. This is to help you decide if you would like to participate and should there be any questions please feel free to ask the researcher.

THE PURPOSE OF THE STUDY

The purpose of the study is to determine the knowledge and practices of food service staff regarding food hygiene and food safety in the Capricorn district hospitals in Limpopo
Before the study you will need to complete:

- This consent form and
- Short biographical information request

During the study you are free to withdraw from the study without giving a reason, and that participation is voluntary. The study will take two weeks to complete.

HAS THE STUDY RECEIVED ETHICAL APPROVAL

This study will commence upon approval from the Medunsa Research Ethics Committee and other relevant authorities within the area**.**

RIGHTS AS PARTICIPANTS IN THE STUDY

Participation is voluntary and you have a right to refuse participation in the study. Refusal to participate will not in any way influence any future relationships with the school or the interviewer.

ARE THERE ANY RISKS

There are no risks attached.

DISCONTINUATION OF PARTICIPANTS IN THE STUDY

No pressure will be exerted on the participant to consent to participate in the study and the participant may withdraw at any stage without penalization.

ANY FINANCIAL ARRANGEMENTS

There are no financial resources that participants can benefit from the study.

CONFIDENTIALITY

All information provided to the research team will be treated as confidential.

INFORMED CONSENT

I hereby confirm that I have been informed by the investigator, (Ms Maphefo Mashuba) about the nature, conduct, benefits and risks of this study. I have also read the above information regarding this study.
I may withdraw my consent as well as my participation in the study and declare that I had sufficient opportunity to ask questions and therefore declare myself prepared to participate in the study.

Parent/guardian's Name _____
Parent/guardian's signature _____ **Date** _____
Investigator's name _____
Investigator's signature _____ **Date** _____

I, Ms Mashuba Maphefo, herewith confirm that the above patient has been informed fully about the nature of the study.
Witness name _____
Witness signature _____ **Date** _____

INFORMED CONSENT FOR PARENTS/GUARDIAN (For minors)

I hereby confirm that I have been informed by the investigator, (Ms Maphefo Mashuba) about the nature, conduct, benefits and risks of this study. I have also read the above information regarding this study.
I may withdraw my consent as well as my participation in the study and declare that I had sufficient opportunity to ask questions and therefore declare myself and my child prepared to participate in the study.

Parent/guardian's name _____
Parent/guardian's signature_____**Date** _____
Investigator's name _____
Investigator's signature _____ **Date** _____
Witness name _____
Witness signature _____ **Date** _____

VERBAL PARENTS/GUARDIANS INFORMED CONSENT

(For parents/guardians who cannot read or write)
I, (Ms Maphefo Mashuba), has read and fully explained to the parent/guardian named _____ the information leaflet that indicates the purpose, nature and benefits of the study. The parent/guardian indicated that they understand everything regarding the study.

I hereby certify that I agreed to participate in the study.
Parent/guardian's Name _____
Investigator's name _____
Investigator's signature _____ **Date** _____
Witness name _____
Witness signature _____ **Date** _____

APPENDIX D

QUESTIONNAIRE
EXAMPLE OF HOW TO COMPLETE THE QUESTIONNAIRE

What is your gender?
If you are female, then you will tick (√) in column 2 as indicated below

Male	**1**
Female	**2√**

PART 1 - Demographic Characteristics

1. Age

	CODE	TICK
Less than 20 years	1	
20 – 30 years	2	
30 – 40 years	3	
40 -50 years	4	
Above 50 years	5	

2. Sex/Gender

Female	1	
Male	2	

3. Years of experience in Food Service Unit

Less than 5 years	1	
5 -10 years	2	
10 - 15 years	3	
15 - 20 years	4	
20 – 25 years	5	
Above 25 years	6	

4. Education

Primary education	1	
Secondary education	2	
Matric/Grade 12	3	
Diploma	4	
Degree	5	

5. Work activity

Cook	1	
Scullery	2	
Cleaner	3	

Supervisor	4	
Other (specify)	5	

6. Attended any course on food hygiene and food safety

Yes	1	
No	2	

PART 2

A. Self-administered knowledge questionnaire on personal hygiene and food hygiene.

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

7. In order for your clothing not to contaminate food you need to:

	CODE	TICK
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	

8. The difference between washing and sanitizing is:

Washing removes contamination and sanitizing destroys microorganisms.	1	
Washing makes things look clean and sanitizing makes them smell good.	2	
Washing removes contamination and sanitizing reduce the number of microorganisms to a safe level	3	
There is no difference	4	

9. If a food handler is sick with bad cold, fever and diarrhoea, he 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	

10. To wash the vessels we can use:

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

11. Which of the following symptoms make the food handler away from work place:

Vomiting	1	
Fever	2	
Diarrhoea	3	
All of the above	4	

12. The best way to destroy any harmful germs that may be present in food is to:

Add salt to the food	1	
Keep food at room temperature	2	
Cook food to the right temperature	3	
Keep food below 5°C at all times	4	

13. Who is responsible for safe and healthy food:

Food service manager	1	
Food service staff	2	
Food service supervisor	3	
All of the above	4	

14. 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	

15. You can prevent food borne illnesses by:

Serving food without washing hands	1	

Washing hands, using gloves and keeping food at the right temperature	2	
Hand washing once in a day	3	
Spraying pesticides on the kitchen floor once in a month so pets would not get in the food	4	

16. Hand washing should be done:

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

17. The important measure to keep harmful germ away from food is to:

Wash hands thoroughly and frequently and use gloves when necessary	1	
Do not touch anyone other than food	2	
Remove all jewellery prior to working with food	3	
Use of hair net/caps before handling food	4	

18. 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	

19. Hands must be dried after washing in order to:

Prevent dripping of water	1	
Prevent germs and bacteria which get spread with wet hands	2	
Hold the utensils properly	3	
a and b	4	

20. Food handlers require knowledge on food hygiene:

To reduce work place accidents such as cuts and burns	1	

To reduce the amount of food thrown away due to spoilage	2	
To prevent the spread of illnesses through food	3	
To reduce the number of complaints from customers/patients	4	

21. What are the signs and symptoms of food poisoning:

Vomiting, Nausea	1	
Stomach ache	2	
Diarrhoea	3	
All of the above	4	

22. Food borne infections occur when people eat:

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

23. 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 leads to poisoning	3	
Freezing prevents transmission and multiplication of bacteria	4	

24. 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	

25. Food hygiene includes:

Hand washing	1	

Cooking	2	
Serving	3	
All of the above	4	

26. Food hygiene is necessary for:

Avoiding food poisoning	1	
Preparing healthy food	2	
Preventing food borne diseases	3	
All of the above	4	

27. Food poisoning is because of:

Not washing hands properly	1	
Serving contaminated food	2	
Touching ready to eat food with bare hands	3	
All of the above	4	

28. Which of the following is a cause of food borne diseases:

Unhygienic food	1	
Hygienic food	2	
Properly cooked food	3	
Properly preserved food	4	

PART 3

Self-administered **practice** questionnaire on food hygiene and food safety.

Dear respondents go through the following statements carefully and complete the items by placing a tick (√) against your appropriate response in the space provided:

29. 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	

30. Which temperature do you maintain for potentially hazardous food that has been cooked and needs to be reheated:

Re-heat to 54°C in a steam table or other hot holding equipment	1	
Re-heat at 63°C or hotter	2	
Re-heat slowly in the oven to 68°C, stirring at least twice.	3	
Re-heat quickly to 73°C or hotter	4	

31. The best way you use to control cockroaches, mice, flies and other pests is to:

Apply pesticide everyday	1	
Just sweep the floor	2	
Pour chlorine in the sink drain	3	
Keep the establishment and garbage area clean, and eliminate hiding places and routes of entry	4	

32. What do you do before handling food item:

Start food preparation	1	
Wash hands thoroughly with warm water and soap for at least 20 seconds	2	
Take the clean dishes out of the dishwasher	3	
Rinse off hands quickly	4	

33. Best way you use to control contamination is to:

Keep the floor and walls clean	1	
Cool down hot food quickly	2	
Wash hands as often as necessary and do not touch ready-to-eat food with bare hands	3	
Keep hot food hot and cold food cold	4	

34. How frequently do you wash your hands:

Every 30 minutes	1	
When your supervisor tells you	2	
When the customers/patients can see your hands	3	
Each time your hands or gloves become contaminated	4	

35. Are you allowed to work in the kitchen, if you have a contagious illness:

Yes	1	
It depends on the type of the contagious illness	2	
Never	3	
Only if no one can tell you are sick	4	

36. Which of the following food will you not touch with bare hands:

The garbage	1	
Food crates	2	
Ready-to-eat food	3	
Spoiled food	4	

37. 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	

38. You wash your hands only in:

Any sink that is free and accessible	1	
An authorized and designated hand washing sink	2	

An authorized hand sink or in the dish wash sink if the hand sink is not working	3	
The sanitizer bucket	4	

39. Where do you store cleaning items and sanitizers:

Away from food items or clean equipment and utensils	1	
At least 15cm above the floor	2	
With equipment's and cleaning utensils	3	
On the shelf above food and utensils	4	

40. 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	

41. How many times can you reheat leftovers:

As many times as you like	1	
Twice	2	
Four times	3	
You should only reheat leftovers once	4	

42. Which of the following did you ever substitute for proper hand washing:

Hand sanitizers	1	
Tissue paper	2	
Gloves	3	
I never substituted proper hand washing	4	

43. Which of the following do you avoid in your workplace (kitchen):

Hand washing	1	
Touching nose and ear	2	

Wearing cap and gown	3	
All of the above	4	

44. What precaution do you take when you prepare cooked and raw food:

I use same kitchen utensils to prepare cooked and raw food	1	
I use separate kitchen utensils to prepare cooked and raw food.	2	
There is no need to take precaution when I prepare cooked and raw food.	3	
I only take precautions when my supervisor tells me to.	4	

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Enquiries: Latif Shamila Ref:4/2/2

Mashuba D
University of Limpopo
Sovenga

Greetings,

Knowledge and practices of food service staff regarding food safety and food hygiene in the public hospitals in Capricorn district Limpopo Province, South Africa

The above matter refers.

1. Permission to conduct the above mentioned study is hereby granted.
2. Kindly be informed that:-
    - Research must be loaded on the NHRD site (http://nhrd.hst.org.za) by the researcher.
    - Further arrangement should be made with the targeted institutions.
    - In the course of your study there should be no action that disrupts the services.
    - After completion of the study, a copy should be submitted to the Department to serve as a resource.
    - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
    - The above approval is valid for a 3 year period.
    - If the proposal has been amended, a new approval should be sought from the Department of Health.

Your cooperation will be highly appreciated.

Head of Department

06/12/2014
Date

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17 Dec 2015

TO WHOM IT MAY CONCERN

This is to confirm, that I, Dr Lutz Ackermann, have read the Research Thesis entitled

"KNOWLEDGE AND PRACTICES OF FOOD SERVICE STAFF REGARDING FOOD SAFETY AND FOOD HYGIENE IN THE CAPRICORN DISTRICT HOSPITALS IN THE LIMPOPO PROVINCE, SOUTH AFRICA"

by Ms **MASHUBA DORCUS MMAPHEFO**

(student number 9641319) and that I am satisfied with the quality of work she has produced in terms of structuring the document, in terms of style, grammar and spelling. Suggestions for suitable corrections and improvements have been made to the candidate.

(Rev. Dr. Lutz Ackermann, Mankweng)

STATISTICIAN'S CONFIRMATION LETTER
TO WHOM IT MAY CONCERN

I hereby state that I have analysed data for the document titled:

KNOWLEDGE AND PRACTICES OF FOOD SERVICE STAFF REGARDING FOOD SAFETY AND FOOD HYGIENE IN THE CAPRICON DISTRICT HOSPITALS IN LIMPOPO PROVINCE, SOUTH AFRICA

by

DORCUS MMAPHEFO MASHUBA (9641319)

Dissertation

Submitted in partial fulfilment of the requirements for the degree of

MASTER OF PUBLIC HEALTH

In the

Faculty of Medical Sciences, Public Health and Health Promotions

School of Health Care Sciences

UNIVERSITY OF LIMPOPO

Supervisors: Ms MM BOPAPE

CO-Supervisor: Mr MP KEKANA

Disclaimer

At time of submission to student, language editing and technical care was attended to as requested by student and supervisor. Any corrections and technical care required after submission is the sole responsibility of the student.

Kind

Regards

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DATE: 15 April 2016