AN INVESTIGATION INTO THE OCCUPATIONAL RISK FACTORS, AND PREVALENCE OF COMMUNICABLE DISEASES AMONGST HEALTH CARE RISK WASTE HANDLERS AT A TREATMENT PLANT IN THE ETHEKWINI DISTRICT, KWAZULU-NATAL, SOUTH AFRICA.

Siphephile Innocentia Myeni (20601400)

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Supervisor : Dr S Ghuman

Co-supervisor : Ms M Dalasile

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DECLARATION

This is to certify that the work is entirely my own and not of any other person unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Durban University of Technology or to any other institution for assessment or for any other purpose.

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Signature of student Date

Approved for final submission

_____ _____

Dr S Ghuman Date

_____ _____

Ms S Dalasile Date

ABSTRACT

The well-being of health care risk waste handlers in treatment plants are a concern. As health care risk waste increases, reported cases of communicable diseases also increase. Various studies have shown that health care risk waste potentially impairs health because of the infectious agents, leading to skin irritation, blood infections, and respiratory problems. Treatment plants play a huge role in decreasing waste capacities. The purpose of this cross-sectional study was to investigate the prevalence of communicable disease and the occupational risk factors amongst health care risk waste handlers in a treatment plant at eThekwini District in KwaZulu-Natal. A self -administered questionnaire was disseminated to a stratified sample of 67 drivers, 85 driver assistants, and 15 machine operators. The sample populous was found to be aware of the dangers inherent in their occupation. Furthermore, a large proportion of the sample population indicated that they had suffered from a cough since the commencement of their occupational duties. However, needle prick injuries and contact with waste medical fluids were two of the most experienced incidences by the sample population. Protective personal equipment (PPE) based studies, with a focus on capturing the use of gloves to get a clearer picture and to help provide standards for regulators to implement, are recommended.

KEY WORDS

Health are risk waste, Communicable diseases, Health care risk waste handler**,** Occupational risk factors

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When I first started this journey, little did I know just how much of me it would require. But once again God has kept to His promise and indeed this document serves as a testament the closing quotes.

My grace is sufficient enough for you, for my power is made perfect in your weakness- "*2 Corinthians 12:9"*

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LIST OF ACRONYMS

ART	: Antiretroviral Therapy
CD	: Communicable Diseases
COVID-19	: Corona Virus 2019 or nCovid-19
DUT	: Durban University of Technology
HAI	: Health Care Associated Infections
HAV	: Hepatitis A
HBV	: Hepatitis B
HCG	: Health Care General Waste
HCRW	: Health Care Risk Waste"
HCV	: Hepatitis C
HCW	: Health Care Waste
HCWH	: Health Care Waste Handlers
HCWM	: Health Care Waste Management
HIV	: Human Immunodeficiency Virus
IBM SPSS 22.0	: International Business Management Statistical Package for Social Sciences 22.0
ICD	: International Classification of Diseases
IREC	: Institutional Research Ethics Committee,
KZN	: KwaZulu-Natal
MDR TB	: Multi Drug Resistant Tuberculosis
MW	: Medical Waste

NCD	: Non-Communicable Disease
NQF	: National Qualification Framework
OSHA	: Occupational Safety and Health Act
PPE	: Personal Protective Equipment
SABS	: South African Bureau of Standards
TB	: Mycobacterium Tuberculosis
WHO	: World Health Organisation
XDR TB	: Extremely Drug Resistant Tuberculosis

GLOSSARY OF TERMS

Health Care Waste	Health care general waste and Health care risk waste
Health Care Risk Waste	portion of health care waste that is hazardous including but not limited to infectious waste, laboratory waste, anatomical waste, sanitary waste, nappy waste and sharps waste.
Health Care Risk Waste Handlers	any person who handles health care risk waste
Health Care Waste Management	A process or methods to help ensure proper waste handling and safety of health care workers and the community
Occupational Risk Factors	A chemical, physical, environmental, biological, human or other agents that could cause harm to a person in the workplace and is potentially modifiable
Duty to Care Principle	An obligation placed on people to act towards others in certain ways and in accordance with certain standards
Matric Certificate	A qualification received in completion of the final year of high school (grade 12, NQF level 4)
Hospital housekeeping staff	People who maintain the sterility, sanitation and environmental safety of patient rooms, work areas, hallways and offices.

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Medical waste (MW) or Health care risk waste (HCRW) is waste generated primarily from hospitals and other health care facilities such as medical laboratories, mortuaries, autopsy centers, and blood banks, to name a few. Literature studies internationally agree that health care risk waste is only second to radiation waste in terms of the potential threat it poses to people and the environment they live in (Wafual, Musiime & Oporia, 2019). Health care waste management (HCWM) is defined by the South African Bureau of Standards (SABS) as all those activities that are involved in the administrative, operational, handling, treatment, storage, recovery, recycling, and disposal of medical waste (South Africa Bureau of Standard: SABS, 2008).

In South Africa, HCWM is legislated through the Hazardous Substance Act, 1973 (Act No. 15 of 1973); the Environment Conservation Act (Act No. 73 of 1989), and the National Environmental Management: Waste Act: 59 of 2008. These acts further classify HCW into two broad categories that are: health care general waste (HCGW) and health care risk waste (HCRW). According to the acts, Health Care General Waste is defined as waste that does not pose an immediate hazard or threat to human health and the environment and is similar to, and should be managed as, the municipal solid waste (The Office of the President of South Africa , 2008) .

Health Care Risk Waste is defined as biohazardous waste or medical waste include, infectious waste, sharps, anatomical or pathological waste, hazardous chemical waste, genotoxic and cytotoxic waste, pharmaceutical waste, and radioactive waste; and any other waste that poses a risk to public health or the environment, (KwaZulu-Natal Department of Health, 2008).

It has been found that HCW consists primarily of 80% HCGW, with only about 20% of the waste being HCRW (Health Professions Council of South Africa, 2016; Doggalli, 2014). Segregating medical waste at the point of generation reduces the financial cost associated with safely managing the medical waste. Safely disposing of HCRW has high-cost implications (KwaZulu-Natal

Department of Health, 2008). The segregation of waste relies on exercising the Duty to Care Principal by other Healthcare workers who generate HCRW while performing their occupational responsibilities. That introduces the possibility of human error in failing to segregate the waste at the point of generation (Al-Emad, 2011). Medical waste that is incorrectly marked can be incorrectly handled, resulting in the persons handling the waste becoming injured or infected.

Health care waste handlers play a significant role in the daily routine management of HCRW. That makes them one of the most at-risk populations to come into contact with any active pathogens contained in the HCRW during its life cycle from the point of generation, handling, treatment, and or disposal (Salkin, 2004). Healthcare waste handlers are therefore at the greatest risk of acquiring communicable diseases due to the hazardous physical, chemical, radiological, and or microbiological nature of the components of HCW (Salkin, 2004). Exposure to HCRW can result in the infection and spread of communicable diseases amongst HCRW handlers. Communicable diseases spread when a susceptible host comes into contact with contaminated surfaces, bodily fluids, or blood products and hence becomes infected (Edemekong & Huang, 2021).

In December 2019, the World Health Organization announced the detection of the novel communicable diseases aptly named the Novel Corona Virus 2019 or Covid-19. Covid-19 is an example of how dangerous and infectious communicable diseases can become to society. The treatment of Covid-19 patients and the infectious nature of the virus further emphasize the need to investigate and understand the knowledge, attitudes, and practices of medical risk waste handlers who are occupationally exposed to a variety of medical waste hazards. This includes waste from Covid-19 patients receiving treatment in isolation wards within the study district of eThekwini, KwaZulu-Natal.

In an International Conference on safe waste management practices hosted by the Department of Blood Safety and Clinical Technology and Department of Protection of the Human Environment and the World Health Organization, Salkin (2004) reported that the concentrations of hazardous chemicals present in HCW are generally significantly low to be considered an occupational problem or a danger to the public. Furthermore, they presented findings that supported a claim that most accidental occupational-related exposures to infectious viruses or bacteria occurred at waste treatment facilities or other locations where the waste handlers needed to manually handle the untreated HCW (Salkin, 2004). Finally, they conceded that in low-income countries like South

Africa, more research was required in this field to help improve the practices and hence reduce the risk and negative impact of healthcare waste on HCW handlers.

This cross-sectional study investigated the prevalence of communicable diseases and occupational risk factors amongst healthcare risk waste handlers in a treatment plant in Westmead, Pinetown, KwaZulu-Natal, South Africa. The treatment plant serves 72 KwaZulu-Natal Government Hospitals, 21 community health centers, and over 700 clinics. The said treatment plant is the major service provider for health care risk waste collection, treatment, and disposal in KwaZulu-Natal. The company was seen as fitting for conducting the research study.

1.2 RATIONALE OF THE STUDY

Health care risk waste handlers in treatment plants are routinely occupationally exposed to a range of communicable diseases like Covid-19, Mycobacterium Tuberculosis (TB), and Human Immunodeficiency Virus (HIV) emanating from health care risk waste. Unsuspectingly, waste handlers may become exposed and infected. Once infected, the handlers become carriers/reservoirs of communicable disease in the chain of infection and pose an immediate threat to those around them at work and in their private citizen capacity (Centers for Disease Control and Prevention, 2012a). As part of excising their Duty to Care Principle, health care risk waste handlers need to report incidences that might have exposed them to communicable diseases, which occur during the execution of their occupational duties, no matter how small. This will help build a comprehensive health profile of the worker and helps both the firm and the handler to take the necessary preventative and reactionary measures to isolate, treat and limit the possible spread of infection.

Personal protective equipment (PPE) plays a significant role in preventing incidences that might compromise the safety of the worker. However, PPE needs proper use, regular replacement, and maintenance for example, dust/face masks to limit contact of infectious toxins or splashes to the mouth and more recently the spread of Covid-19 needs regular replacement or maintenance if they are to remain effective. Workers' knowledge attitudes and practices concerning PPE are thus crucial in understanding the occupational risk factors to which HCRW workers are exposed from

their perspective. One infected worker poses a risk to himself and the immediate professional and personal community around him.

To get a comprehensive snapshot of the occupational risk factors as well as the prevalence of the communicable disease among healthcare risk workers in the district, the major service provider for healthcare risk waste collection, treatment, and disposal in Kwazulu-Natal was approached and selected for this study.

1.3 SIGNIFICANCE OF THE STUDY

Various studies have highlighted the need to understand the knowledge, attitude, and practices of low-income countries' health care risk waste management personnel (Salkin, 2004; Abanyie et al., 2021; Al-Emad, 2011; Bleck & Wettberg, 2012). That is considering the inherent risk associated with this waste. Health care risk waste handlers in treatment plants are routinely occupationally exposed to range of communicable diseases stemming from contaminated waste that they need to handle for example, loading and offloading the waste to and from the waste trucks.

KwaZulu-Natal is the second-most populous province in South Africa (KwaZulu Natal: Department of Health, 2020). Hence, effective surveillance of healthcare-associated infections (HAIs) is a key aspect of infection prevention and control (KwaZulu Natal: Department of Health, 2020). Attention to hand hygiene has been identified numerous times in literature as a simple measure that would result in a significant decrease in HAIs (Alaska Department of Health and Social Services, 2021; Giusti, 2009). However, the KwaZulu Natal Department of Health (2020) found that the lack of compliance in Kwa-Zulu Natal amongst HCWs is high and the reasons for non-compliance are multi-factorial.

Habitually practicing the Duty to Care Principle when separating the waste at the point of generation is subject to the same non-compliance factors as washing of hands (KwaZulu-Natal: Department of Health, 2020). Failure to correctly separate sharps at the point of waste generation results in sharps being transported in unsuitable containers, which may (during waste management) render the risk waste handler at high risk of being exposed to contaminated sharps and needles.

1.4 AIM OF THE STUDY

The aim of the study was to investigate the prevalence of communicable diseases amongst healthcare risk waste handlers in treatment plants and investigate the occupational risk factors amongst healthcare risk waste handlers in treatment plants in KwaZulu- Natal South Africa.

1.5 OBJECTIVES OF THE STUDY

1. To determine the prevalence of communicable disease amongst healthcare risk waste handlers in a treatment plant
2. To identify the occupational risk factors in handling health care risk waste in a treatment plant in a low-income/ developing country.

1.6 REPORT OVERVIEW

This report is divided into six chapters. Chapter 1 introduced the study by presenting the key background information around the study. In doing so, the field of HCWM and the key role that health care risk waste handlers play in HCWM was presented. The daily occupational hazards that these workers face routinely were then briefly highlighted, with the core of the discussion surrounding their occupational risk hazards being left for discussion in Chapter 2 of this report. The next chapter of this report, Chapter 2, discusses in detail the various occupational risk hazards that health care risk waste handlers encounter within the study district of eThekwini in Kwa-Zulu Natal, South Africa.

Chapter 3 of this report details how the research was conducted to satisfy the objectives stated in Chapter 1 of the report. Chapter 4 presents the results of the questionnaire that was used to investigate the knowledge, attitude, and awareness of health care risk waste handlers with regards to health care risk waste management as well as the prevalence of communicable diseases among the handlers. Chapter 5 discusses in detail the results presented in Chapter 4 in light of the research objectives presented in this chapter as well as the literature review presented in Chapter 2. The

final chapter, Chapter 6, of this report presents the authors' recommendations on the research questions and health care risk waste management.

1.7 CONCLUSION

This chapter has presented the background to the study that was undertaken to investigate the occupational hazards as well as the prevalence of communicable diseases among healthcare risk waste handlers at a major treatment plant in eThekwini, Kwa-Zulu-Natal. In presenting the rationale and significance of the study, the focal role played by the study population in the management of health care waste was highlighted. This was done to shed light on the hazardous environment as well as the key role played by these workers in ensuring that health care waste is safely discarded or treated for the betterment of society as a whole. The next chapter of this report, Chapter 2, presents a brief overview of the literature review to understand what has been done by fellow researchers in addressing the challenges in medical risk waste management.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter begins by defining "health" for an individual. From this definition, a state of being unhealthily or ill is introduced. This then forms the point of departure for the discussion on the communicable diseases that health care risk waste workers are likely to encounter in the local South African setting of this study. In doing so, the chain of infection, which is the necessary sequence of events required for the transmission of communicable diseases to occur, is discussed in light of the medical waste handling occupational hazards that waste handlers encounter during the execution of their occupational duties.

2.2 COMMUNICABLE DISEASES AFFECTING HEALTH CARE WASTE HANDLERS

Employing the International Classification of Diseases (ICD), which contains approximately 8 000 categories of causes of death which are organized into 22 chapters consisting of communicable diseases, non-communicable diseases, ill-defined causes of death, and external causes of injury and death. Statistics South Africa (2018) has found that over 10 years straight, communicable diseases which fall under "Certain infectious and parasitic disease (A00-B99) ", Figure 2.1, and Table 2.1, constitute the second most leading cause of deaths in South Africa (Statistics South Africa, 2018).

The leading causes of death in South Africa are depicted in Figure 2.1. It is plausible to assume that medical waste generated from primary care facilities in South Africa contains traces of the infectious agents that cause the diseases summarized in Table 2.1.

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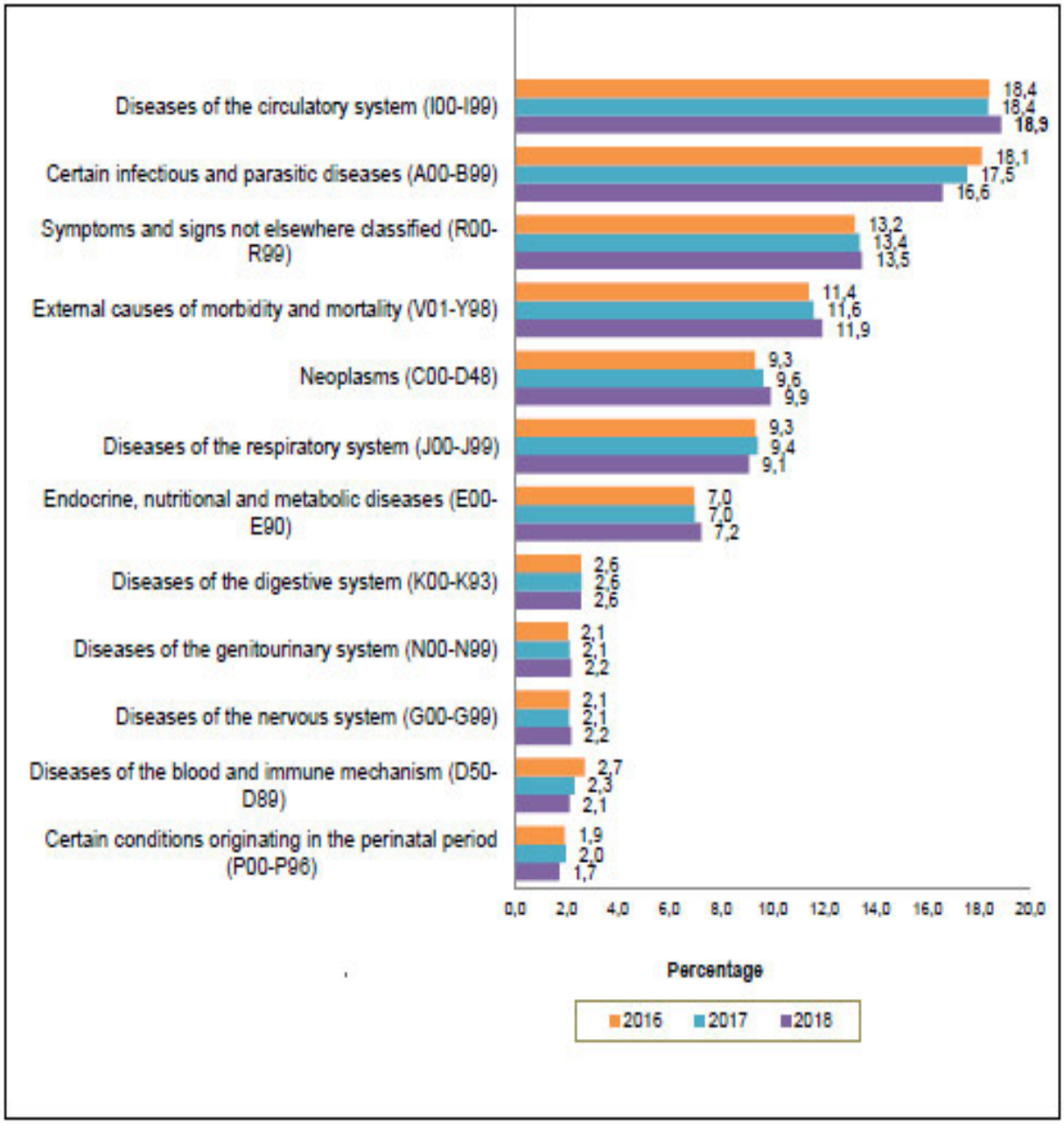

Figure 2.1 : Percentage distribution of deaths by main groups of causes in South Africa, 2016- 2018 (Statistics South Africa , 2018)

Table 2.1 : Infectious and parasitic diseases groups, (A00- B99), of the second most leading cause of deaths in South Africa

ICD CODE	ICD Category Description	Communicable diseases associated with infectious agent or parasitic group.	Transmission mode
A00-A09	Intestinal infectious diseases	Examples: Cholera and typhoid.	
A15-A19	Tuberculosis	Respiratory tuberculosis	Respiratory transmission
A20-A28	Certain zoonotic bacterial diseases	Not communicable diseases, but waste handlers are exposed to the set of all diseases treated by public hospitals.	Vector transmission
A30-A49	Other bacterial diseases	Whooping cough	
A50-A64	Infections with a predominantly sexual mode of transmission	Congenital syphilis Gonococcal infection	
A65-A69	Other diseases		
A70-A74	Other diseases caused by chlamydia		
A75-A79	Rickettsioses		
A80-A89	Viral infections of the central nervous system	Acute poliomyelitis	
A92-A99	Arthropod-borne viral fevers and viral fevers		
B00-B09	Viral infections characterised by skin and mucous membrane lesions		
B15-B19	Viral hepatitis	Acute hepatitis A / Acute hepatitis B	
B20-B24	Human immunodeficiency virus [HIV] disease		
B25-B34	Other viral diseases		
B35-B49	Mycoses		
B50-B64	Protozoal diseases		
B65-B83	Helminthiases		
B85-B89	Pediculosis, and other infestations		
B90-B94	Sequelae of infectious and parasitic diseases		
B95-B98	Bacterial, viral and other infectious agents		
B99-B99	Other infectious diseases		

Source : (World Health Organisation, 2022a)

2.2.1 COUGH

A cough is defined as “a voluntary or involuntary act that clears the throat and breathing passage by rapidly expelling air from the lungs” (National Health Service (NHS)-the United Kingdom, 2021). There exist a number of possible underlying reasons behind someone experiencing a cough, and most coughs will clear up on their own without the need to seek medical intervention (National Health Service (NHS)-the United Kingdom, 2021). Most acute coughs or” short-term” coughs are caused by a cold or influenza.

Viruses are spread mainly from person to person by inhaling droplets produced when an ill person coughs sneezes or talks. Viruses may also spread through contact with an infected object, such as medical waste which may contain sufficient traces of the virus, and then touching the mouth, eyes, or nose with the contaminated hands, (Centers for Disease Control and Prevention , 2020).

2.2.2 SKIN RASH

A rash is a noticeable change in the texture or color of the skin. The skin may become scaly, bumpy, itchy, or otherwise irritated (Phillips, 2018). Like a cough, a rash can be caused by an array of underlying causes, and common causes include contact dermatitis, bodily infections, bacterial, fungal, viral, or parasitic infection, and allergic reactions to taking medication, (Wisconsin Department of Health Services, 2016).

Some rashes are contagious, and some are not. Most of those that are contagious are caused by bacteria, viruses, or fungi and Infectious rashes may be transmitted in several ways, depending on the germ (Doggalli, 2014). Contagious rashes can be transmitted by touching an object or surface with the germ on it and then touching the face or an open wound without washing the hands, (Doggalli, 2014)

A laboratory-based surveillance mapping of antimicrobial resistance and molecular epidemiology conducted from 2010 to 2012 found that the prevalence of Staphylococcus aureus bacteremia in hospitalized patients in South Africa was high (Perovic et al., 2015). Staphylococcus aureus or “staph” is a type of bacteria found on human skin that is spread by touching infected blood or body

fluids, most often by contaminated hands. Staphylococcus aureus is the leading cause of skin and soft tissue infections such as red, swollen, painful, and warm skin (Association for Professionals in Infection Control and Epidemiology, 2022) Furthermore, it was found by Perovic et al. (2015) that the majority (59.5%) of analysis isolates of Staphylococcus were from Gauteng Province followed by the Western Cape (26%), KwaZulu-Natal (11%) and the Free State Province (3.5%).

2.2.3 TUBERCULOSIS (TB)

Tuberculosis (TB) is a potentially serious infectious disease that mainly affects the lungs. If not treated properly, TB disease can be fatal. TB is caused by a bacterium called *Mycobacterium(M) tuberculosis*. Transmission of TB in health care settings to both patients and health care workers (HCWs) has been reported in virtually every country of the world, regardless of local TB incidence (Baussano et al., 2011). Tuberculosis (TB) bacterium is spread through the air from one person to another. The TB bacteria are put into the air when a person with TB disease of the lungs or throat coughs, speaks or sings. Unsuspecting people or coworkers nearby may breathe in these bacteria and become infected, should they be susceptible to the bacterium (Centers for Disease Control and Prevention (CDC), 2016). Risk waste handlers are at risk of contracting TB. Johnson et al. (2000) found that processing contaminated medical waste resulted in transmission of M tuberculosis to at least one medical waste treatment facility worker. This marked the first time in literature where occupational exposure to medical waste was positively identified as the cause of a TB infection. Furthermore, it was revealed that the facility had defects in equipment, available respiratory equipment, and personnel training. TB can affect anyone, and globally the highest burden is in adult men, who accounted for 56% of all TB cases in 2020; by comparison, adult women accounted for 33% and children for 11% (World Health Organization, 2021a). South Africa forms part of 30 countries that the WHO has identified as high TB burden countries with more than 500 cases per 100 000 populations (World Health Organization, 2021a). Multiple studies have confirmed that the KwaZulu-Natal Province has the highest prevalence of drug-resistant TB in the world (Auld et al., 2018; Kapwata et al., 2017; Lim et al., 2015; Streicher et al., 2012; Yudkin et al., 2008). It has been recently estimated by Wallengren et al. (2011) that XDR TB, which was first identified in South Africa in the eThekwini District, accounted for 38% (2,799) of 7,350 Multi Drug Resistant Tuberculosis (MDR TB) cases and 50% (270) of 536 Extremely Drug Resistant Tuberculosis

(XDR TB) cases in the country The reported MDR TB incidence rate per 100,000 population of KwaZulu-Natal is among the highest worldwide (World Health Organization, 2021a).

2.2.4 HEPATITIS

Hepatitis is a general term referring to inflammation or swelling of the liver (Centers for Diseases Control and Prevention, 2021; The Republic of South Africa Department of Health, 2019). There are five distinct types of viral hepatitis (A, B, C, D, and E) (World Health Organization, 2021b). However, globally 95% of all hepatitis-related diseases and untimely deaths are the results of chronic Hepatitis B and C. Hepatitis A and E cause acute infections which are short-lived and can be resolved within a few weeks (World Health Organization, 2021b). Hepatitis A (HAV) and B (HBV) are highly endemic in South Africa (The Republic of South Africa Department of Health, 2019).

Units/categories of employees identified to be at high risk of contracting HIV & related diseases (if any)	Key steps taken to reduce the risk
Nurses	Empowerment Hepatitis B immunizations, HIV Counselling and Testing (HCT), Provision of PPE
Doctors	Occupational Post Exposure Prophylaxis (OPEP), Provision of PPE
General Assistants	Use of Personal Protective Clothing, education
All other employees	
Sexually active.	Baseline assessments .Health Education.
Long distance relationship	Psychosocial Support through EAP.
Married couples –not staying together–for some other reasons e.g. employment/on separation.	Conducting wellness activities in institutions, for health promotion.
Drugs/Alcohol abusers	Counselling through EAP services
Vulnerable groups e.g. on divorce process/widow/widower/elderly.	Monitor implementation of COID Act regarding occupational diseases & injuries.
Employees at risk of being raped e.g. night shift staff/staff in wards where prisoners are admitted.	Provision of adequate security measures. Monitoring of implementation of OHS Act and Education.
Single parents-staying alone.	Psychosocial Support through EAP and Health education.
Front-Line /OPD/Casualty/Crisis Centre/CDC & Medical, Maternity Wards and Theatre employees.	Provision of EAP services and referrals accordingly, Personal Protective Equipment (PPE), Education and OPEP.
Tracer & injection teams /Family Health Teams/CCG's/School Health Teams.	Implementation of HIV and AIDS policies and education.
Staff diagnosed with TB.	All tested for HIV

Source: Chief Director: OES, EHW and Labour Relations

Figure 2.2. An extract of the gazette steps that are to be taken to reduce the risk of occupational exposure of health care workers (KwaZulu Natal: Department of Health: Annual Report 2019/2020 : Vote 7 (2020b)

Figure 2.2 is extracted from KwaZulu Natal: Department of Health (2020b). It maps out the algorithm that the KwaZulu-Natal Department of Health is to adopt across all public health institutions within the provinces. These are adapted to work simultaneously with the department to reduce the risks associated with working in an environment where communicable diseases are concentrated within a small area namely, public health hospitals that the study population services.

2.2.5. HEPATITIS A VIRUS

Hepatitis A is very contagious and is found in the stool and blood of people who are infected. Transmission of the Hepatitis A virus, which is the root cause of Hepatitis A liver infection, occurs when a susceptible host comes into close through close personal contact with microscopic amounts of the virus and then unknowingly ingests the virus (Centers for Diseases Control and Prevention, 2021; World Health Organisation , 2021b).

2.2.5.1 HEPATITIS B VIRUS

Hepatitis B is preventable and treatable common serious liver infection yet globally the seroprevalence[1] is 1 in 3 or (two billion people) (Hepatitis B Foundation, 2021). Like Hepatitis A, Hepatitis B is highly contagious. Transmission of the virus occurs when bodily fluids (for example, saliva, menstrual, vaginal and seminal fluids), and food or drink contaminated microscopic amounts of the virus, are unknowingly ingested by a susceptible host. Transmission can also occur through a needle stick injury or infected sharp waste objects found in health care settings (World Health Organisation, 2021b).

[1] "the level of a pathogen in a population, as measured in blood serum" (Centers for Disease Control and Prevention , 2012)

2.2.6 HUMAN IMMUNODEFICIENCY VIRUS

First identified in 1981, the Human Immunodeficiency Virus (HIV) attacks the host white blood cells that help the body fight other infections (HIV.org, 2020). There is no known cure for HIV, however treatment called antiretroviral therapy or ART is available. South Africa, which is globally at the epicenter of the HIV pandemic, has the largest ART programme in the world, which is primarily funded from domestic resources, rather than international donor contributions (Bekker et al., 2014; Avert, 2020; Vandormael et al., 2020).

HIV is found in the body fluids of an infected person. This includes semen, vaginal and anal fluids, and blood and breast milk. HIV cannot be transmitted through sweat, urine or saliva, however the most common way of getting HIV is through having anal or vaginal sex without protection (National Health Services UK, 2021). HIV is a fragile virus and does not survive outside the body for long (National Health Services UK, 2021), but waste needles, syringes or other injecting equipment can contain sufficient traces of the virus to cause transmission of the virus.

2.2.7 OTHER COMMUNICABLE DISEASES

Apart from the communicable diseases discussed above, a number of other virus and pathogens may exist in hospital waste depending on the conditions that are treated in the hospital where the waste is been generated.

2.3 CHAIN OF INFECTION

In the epidemiologic triad model, it is stated that “infectious diseases result from the interaction of agent, host, and environment”. The chain of infection (Figure 2.3) refers to the necessary sequence of events that is required in order for a microbe or infectious disease to be spread from person to person (Van Seventer & Hochenberg , 2017). If the chain is broken the infectious organism is not able to go on to infect and develop disease in another person. Breaking the chain of infection is paramount to controlling the prevalence of communicable diseases transmission even amongst coworkers (The Government of Nunavut, 2022). Each of the six links-infectious agents, reservoirs,

portal of exists, means of transmission, portal of entry, susceptible host- is discussed in depth in this subsection of the report.

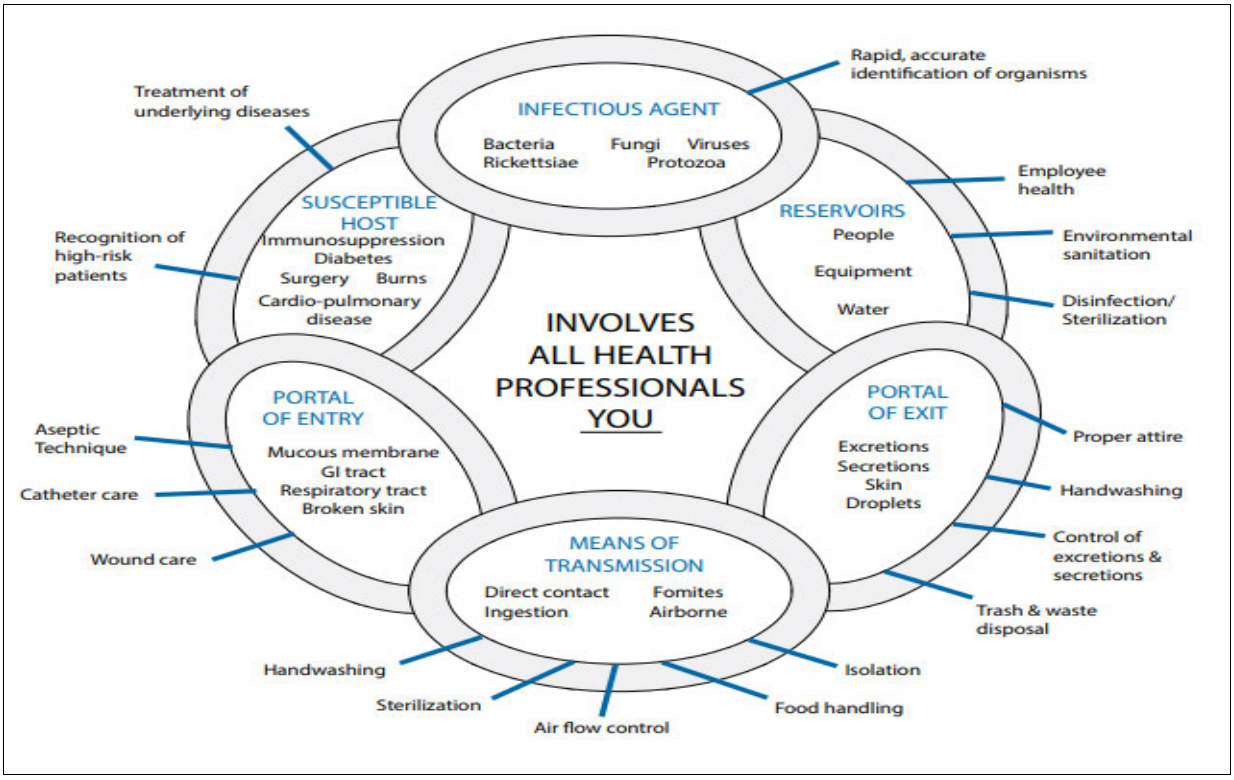

Figure 2.3 The chain of infection for communicable disease transmission and infection. (The Government of Nunavut, 2022)

2.3.1 INFECTIOUS AGENTS

An infectious agent is a microorganism or pathogen that causes communicable diseases. Most commonly, these are bacteria, virus, fungi or parasites. Sources of infectious agents are contained in the waste generated when patients in primary care facilities such as public hospitals, as described in Chapter 1 of this report, are treated for a particular communicable disease. Some infectious agent(s) as found in Table 2.1 on page 9 can be harbored in medical waste. Both the ill patients and the waste generated in treating the patients are reservoirs for the infectious agents.

2.3.2 MEDICAL WASTE: INFECTIOUS AGENT RESERVOIR

An infectious agent needs a habitat in which the agent can live, grow, and multiply namely, a reservoir. As indicated in the previous paragraph, patients; medical waste and the environment can all be reservoirs for microorganisms. Medical waste bags in hospitals together with medical waste storage areas act as a reservoir for some infectious agents that is; they allow some of the pathogens to live, and possibly grow, and multiply (Centers for Disease Control and Prevention , 2012a).

2.3.3 ROUTE OF EXIT

The path which allows an infectious agent to leave its host or reservoir is aptly termed the "route of exit" of the infectious agent. The path usually corresponds to the site where the pathogen is localized and can include blood, respiratory secretions, and anything exiting from the gastrointestinal or urinary tracts for example (hepatitis B) scan exit (or enter) through cuts or needles in the skin, (Centers for Disease Control and Prevention , 2012).

2.3.4 MODE OF TRANSMISSION

Microorganisms such as pathogens cannot travel from one host to another on their own. They require a medium to transmit them to other persons (hosts) or places (reservoirs). There are different classifications for modes of transmission. This refers to the route (medium) by which the infectious microorganisms escape or leave the reservoir. Table 2.2 on page 17 shows an overview of the modes of transmission for communicable disease together with some of the measures that waste handlers can employ to limit the chances of acquiring an infection from carrying out their occupational duties, (Centers for Disease Control and Prevention , 2012).

Direct contact transmission of an infectious agent is the transmission of the agent from a reservoir to a susceptible host by direct contact with infectious agent or droplet spread (Centers for Disease Control and Prevention, 2012a). Droplet spread is produced by sneezing, coughing, or even talking. Hence why an unknowingly infected waste worker, poses a serious threat to himself and his social environment as they can transmit occupationally acquired pathogens to those in their social circle through regular socializing.

Indirect transmission is the transfer of an infectious agent from a reservoir to a new host where there is no direct human-to-human contact. Transmission occurs through suspended air particles, inanimate objects (vehicles, namely, food or water may carry hepatitis A virus.), or animate intermediaries (vectors namely, mosquitoes, fleas, and ticks may carry an infectious agent through purely mechanical means) (Centers for Disease Control and Prevention , 2012b).

Table 2.2 Overview of the modes of transmission for communicable diseases

Modes of Transmission	**Example of Microorganism**	**Breaking the Link**
Respiratory Tract Infections (Direct Infection) When people speak, cough, sing droplets of water vapour are exhaled as a spray, so when the infected person partakes in any of these activities, microorganisms leave the body of the infected person and may be transmitted to the people next to them.	Covid-19	• Wear a mask • Do not talk directly into an ill person's face • Take sick leave if you are sick. • Practice good cough etiquette, namely, cover your mouth when coughing or sneezing • Waste handlers should perform good hand hygiene namely, wash your hands regularly with soap and water or with alcohol-based hand sanitisers
Gastrointestinal Tract Infections Pathogens that leave the body of the infected person by means of bodily waste secretions for example, stool and vomit.	Hepatitis A virus can be shed in medical waste containing the stool of the infected patient.	• Handle medical waste bags carefully • Use personal protective equipment (PPE) • Perform good housekeeping • Perform good hand hygiene namely, wash and sanitise hands regularly
Skin Pathogens that exit the body of the infected person by wound drainage or through skin lesions		• Use personal protective equipment (PPE) • Perform good hand hygiene
Blood Infection may occur when someone's blood gets into another person's system	HIV	• Safe handling of sharps • Use gloves, (PPE), for procedures where there is risk of exposure to blood • Use care in obtaining, transporting and processing medical waste bags.

(The Government of Nunavut, 2022)

2.3.5 WASTE HANDLING INCIDENCES AS ROUTES OF ENTRY

Infectious agents generally enter the body of the new host through the same route they exited the reservoir. Table 2.3 shows a summary of the most common modes of entry and possible barriers for communicable diseases that can mitigate or in some cases eliminate the risk of exposure to the waste handler. From Table 2.3, personal protective equipment such as thick rubber gloves can greatly mitigate several routine risk waste handling occupational hazards such as exposure to infected sharps and needles. Sharps and needles can result in incidents that create open wounds; namely, an external or internal break in body tissue, involving the skin. Skin is the body's natural barrier to infection. Therefore, any break in the skin, intentional or unintentional, invites infectious agents to enter the body (Atrain Education, 2022).

Table 2.3 Modes of entry and barriers for communicable diseases

Modes of Entry	Breaking the Chain: Barriers to entry.

Respiratory Tract Droplets of water vapour from the respiratory tract of infected person can remain suspended in the air of poorly ventilated space such as a vehicle with closed windows for periods of time. The pathogen can then be inhaled by an uninfected person who may then become infected with the disease	• Wear a clean mask/respirator • Maintain good ventilation, especially is small spaces. • Isolate those with respiratory symptoms • Perform good hand hygiene namely, wash hands with soap and water or apply alcohol based sanitiser regularly.
Gastrointestinal Tract Pathogenic microorganisms enter the body of a susceptible new host when food or water contaminated by faeces is unsuspectingly ingested (faecal/oral route).	• Handle risk waste bags using PPE and carefully. • Perform good housekeeping of all tools and equipment. • Wear appropriate personal protective equipment (PPE) • Perform good hand hygiene
Mucous Membranes	• Protect eyes, nose and mouth with a face shield or mask during procedures likely to generate splashes or sprays
Pathogenic microorganisms can enter a potential new host through exposed eyes, nose and mouth.	• Carry out good housekeeping • Perform good hand hygiene • Handle risk waste bags carefully and properly • Wear personal protective equipment
Skin An uninfected person becomes infected when microorganisms enter their body when they come into contact with wound drainage or skin secretions	• Maintain healthy intact skin that is intentionally scratching the skin namely, scratching, itchy mosquito bite site, as a risk waste handler should be avoided • Perform good hand hygiene

(The Government of Nunavut, 2022)

2.3.6 HCRW HANDLER: THE SUSCEPTIBLE HOST

A healthy immune competent persons' immune system works in harmony as a complex network of cells, tissues and organs that interact to defend the body against infections. Therefore, mere exposure to a pathogen does not necessarily result in infection of the host but rather depends on three main factors namely, the person exposed (the host) health status, the pathogen (the agent), and the environment, (Van Seventer & Hochenberg , 2017).

A susceptible host is therefore a person whose immune system is compromised such that exposure to a pathogen result in it establishing itself in them causing infection, disease and possibly death. Table 2.4 lists risk waste handlers who are more at risk namely, more likely to be susceptible hosts and developing disease resulting from exposure to infectious agents. In Table 2.4, control measures that can be employed to help mitigate the risk of infection to these susceptible hosts are provided, (Edemekong & Huang , 2021).

Table 2.4 Susceptible host for infection and applicable control measures

Susceptible Hosts	Control
• **Waste handlers who are very old** • **Waste handlers on inadequate diets** • **Waste handlers who are chronically ill** • **Waste handlers receiving medical therapy such as chemotherapy or high doses of steroids** • **Waste handlers who are already ill** • **Waste handlers with open wounds**	• Vaccinate against vaccine preventable diseases for example, Hepatitis • Maintain proper ventilation, especially in confined spaces. • Perform regular medical checkups and diagnose and treat any underlying disease early. • Wear correct personal protective equipment (PPE) when handling waste • Maintain good hand hygiene • Supplement poor diets

(The Government of Nunavut, 2022)

Breaking the chain of infection is paramount within the at-risk group of medical risk waste handlers. This is because the population, medical risk waste handlers, is routinely exposed to a variety of pathogenic microorganisms which they can spread across wide geographic areas quickly given that a single worker can cover a single district within a one week, while occupationally collecting medical waste. It has been discussed in this section of the report how the chain of infection can break should a waste handler be accidently exposed to pathogenic microorganisms. It is important that transmission be interrupted; the agent eliminated, inactivated or the conditions be created such that the agent cannot exit the reservoir namely, the portals of entry are contained through safe infection control practices for example, the strict adherence to the use of personal protective equipment when handling waste together with the practice of good hand hygiene, (Van Seventer & Hochenberg , 2017).

2.4 MEDICAL WASTE HANDLING COMMON HAZARDS

Every employer has a responsibility to provide a safe and healthy working environment to their employees, particularly in health care settings (Sharma , Sharma, Sharma & Singh, 2013; KwaZulu Natal: Department of Health: Annual Report 2019/2020 : Vote 7 , 2020)

Medical risk waste poses physical, chemical, radiological and or microbiological hazards. Medical risk waste handlers are routinely occupationally exposed to a variety of hazardous waste products. Of these hazards, needle stick injuries, contact with waste fluids and inhalation of toxic substances, are some of the more frequently occurring incidences a waste handler is likely to experience, and hence form the main subject of discussion in this section of the report, (Health Professions Council of South Africa, 2016).

2.4.1 NEEDLE STICK INJURIES

Sharps such as hypodermic needles, intravenous set needles, broken vials, and ampoules may not only cause cuts and punctures, but also infect these wounds if they are contaminated with pathogens. Needles constitute an important part of the sharps waste category and are particularly hazardous because they are often contaminated with patients' blood. Globally, approximately 16 billion injections are administered every year (World Health Organization, 2018). Doggalli (2014) reported that an infective dose of Hepatitis B or C virus can survive for up to a week in a blood droplet trapped inside a hypodermic needle. Furthermore, the World Health Organisation (2018) found that a waste handler who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8%, and 0.3% respectively of becoming infected with HBV, HCV and HIV.

Proper waste segregation at the source, together with the provisioning and use of adequate personal protective equipment (PPE) has been found to reduce the risk of injury to those handling waste (Deress, Jemal , Girma & Adane, 2019 ; Bazie , 2020; Berhan et al., 2021;Padmansbhan & Debrata, 2019).

2.4.2 CONTACT WITH INFECTIOUS WASTE FLUIDS

Medical waste fluids include blood cultures, stocks of infectious agents from laboratory work, and other bodily fluids. This category of medical waste poses a serious health hazard to those handling the waste. As detailed in 2.2.5.1, HAV Hepatitis A is very contagious and is found in the stool and blood of people who are infected. The virus can "survive for 7 days or more on environmental surfaces exposed to body fluids containing the virus. It can survive exposure to some antiseptics and to 70% ethanol and remains viable for up to 10 hours at a temperature of 60°C (International Committee of the Red Cross, 2011). Infection may occur when the virus transmitted by infected body fluids or implanted via mucous surfaces becomes introduced through breaks in the skin (Tweedy , 2014).

HIV is less resistant when outside its ideal host (human). It survives for no more than 15 minutes when exposed to 70% ethanol and 3–7 days at ambient temperature and it is inactivated at 56°C. Hence it is important for waste handlers to practice caution when carrying out their duties as waste can still contain active pathogens from patients receiving treatment (International Committee of the Red Cross, 2011).

Waste medical fluids can contain infectious traces of a library other microorganisms whose discussion is beyond the scope of this present paper. The reader may refer to Atrain Education (2022) ; Centers for Disease Control and Prevention (2012b) for a more detailed discussion on the subject.

2.4.3 INHALATION OF TOXIC SUBSTANCES AND OTHER AIRBORNE HAZARDS

Air that is locally polluted, that is within a small area like a room, poses an insidious health hazard. This is because air-suspended infectious nuclei or dust that could be easily and unsuspectingly inhaled or digested. This may lead to acute coughing and other respiratory infections such as Tuberculosis, (TB) as already discussed in the previous sections of this chapter. Personal protective equipment such face masks and respirators play an important role in preventing the inhalation of harmful airborne substances and provide fresh air in oxygen (Tweedy, 2014). Air-purifying respirators come in either full-face or half-mask versions. These types of respirators use a

mechanical or chemical cartridge to filter dust, mists, fumes, vapors, or gaseous substances (Tweedy, 2014)

The employer should ensure that waste handlers assigned tasks requiring the use of a respirator must possess the physical ability to work while using the device. This is in line with occupational safety and health act (OSHA) which requires employers to ensure the medical fitness of individuals that must wear respirators.

2.5 CONCLUSION

This chapter has used data on the leading causes of deaths in South Africa to contextualize communicable diseases that health care risk waste handlers within the study setting are most likely to encounter during the execution of their occupational duties. This then allowed the investigation and presentation of a discussion on the chain of infection, based on communicable diseases that have been identified. These are most likely to be encountered by the study population during the execution of their occupational duties. A detailed discussion on medical waste handling occupational hazards faced by the study population followed.

In the next chapter, Chapter 3, a detailed description on the systematic procedure used by the researcher to conduct the study is presented.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In the previous chapter of this report, literature on the occupational risk factors that health care risk waste handler's face daily has been discussed in light of the research aims and objectives. This chapter presents how the research investigation was systematically conducted. This chapter focused on the research methodology used in this study. It describes and discusses the research design and method, research setting, study population, sample and sampling technique, data analysis and the process of data collection. It also presents how research rigor and ethical considerations were ensured.

3.2 STUDY DESIGN

Creswell (2014) described research design as types of inquiries within research approaches that provided specific direction for the procedures to be followed. A research design is an overall plan for addressing a research question, including specifications for enhancing the study's integrity. A quantitative cross-sectional study design was used to investigate the occupational risk factors and communicable diseases amongst HCRW handlers in a treatment plant at eThekwini District in KZN. Data was collected through questionnaires focusing on treatment plants health care risk waste handlers over the period of three months. Data will be used to make statistical inferences about the population at hand.

3.2.1 QUANTITATIVE RESEARCH

This approach is used for exploring the meaning individuals or groups assign to a social or human issue (Creswell, 2014). Quantitative research uses methods such as questionnaires or structured interviews to generate statistics. The research involves more people with shorter contact than with qualitative research (Dawson, 2010:15). Quantitative means expressing quantities and quantitative research refers to a research design that relies mostly on data expressed in quantities for example; numbers, graphs or formulae.

The study of the defined sample population was conducted by administering a questionnaire, while observing all ethical considerations documented further in this chapter of the report. Data gathered (through the questionnaire) from HCRW handlers were analyzed using SPSS 2021 statistical software. Thereafter they were summarized, and presented in Chapter 4 of this report.

3.3 STUDY LOCATION

South Africa is the sixth African country with the largest population (Galal, 2021). It is a country located at the southern tip of Africa. In 2019, it had an estimated population of 58, 78 million. Further, it is estimated that just over half the population is female (51, 2%) (The Republic of South Africa Government, 2021). Geographically, South Africa is officially subdivided into nine provinces. Gauteng comprises the largest share of the South African population, with approximately 15, 2 million people (25, 8%) living in the province. KwaZulu-Natal is the province with the second largest population, with an estimated population of 11, 3 million people representing 19, 2% of the country's total population (The Republic of South Africa Government, 2021).

KwaZulu-Natal is divided into one metropolitan municipality (eThekwini Metropolitan Municipality) and 10 district municipalities, which are further subdivided into 43 local municipalities, Figure 3.1 (Yes Media, 2021). eThekwini is the largest city in this province and the third-largest city in the country by land mass.

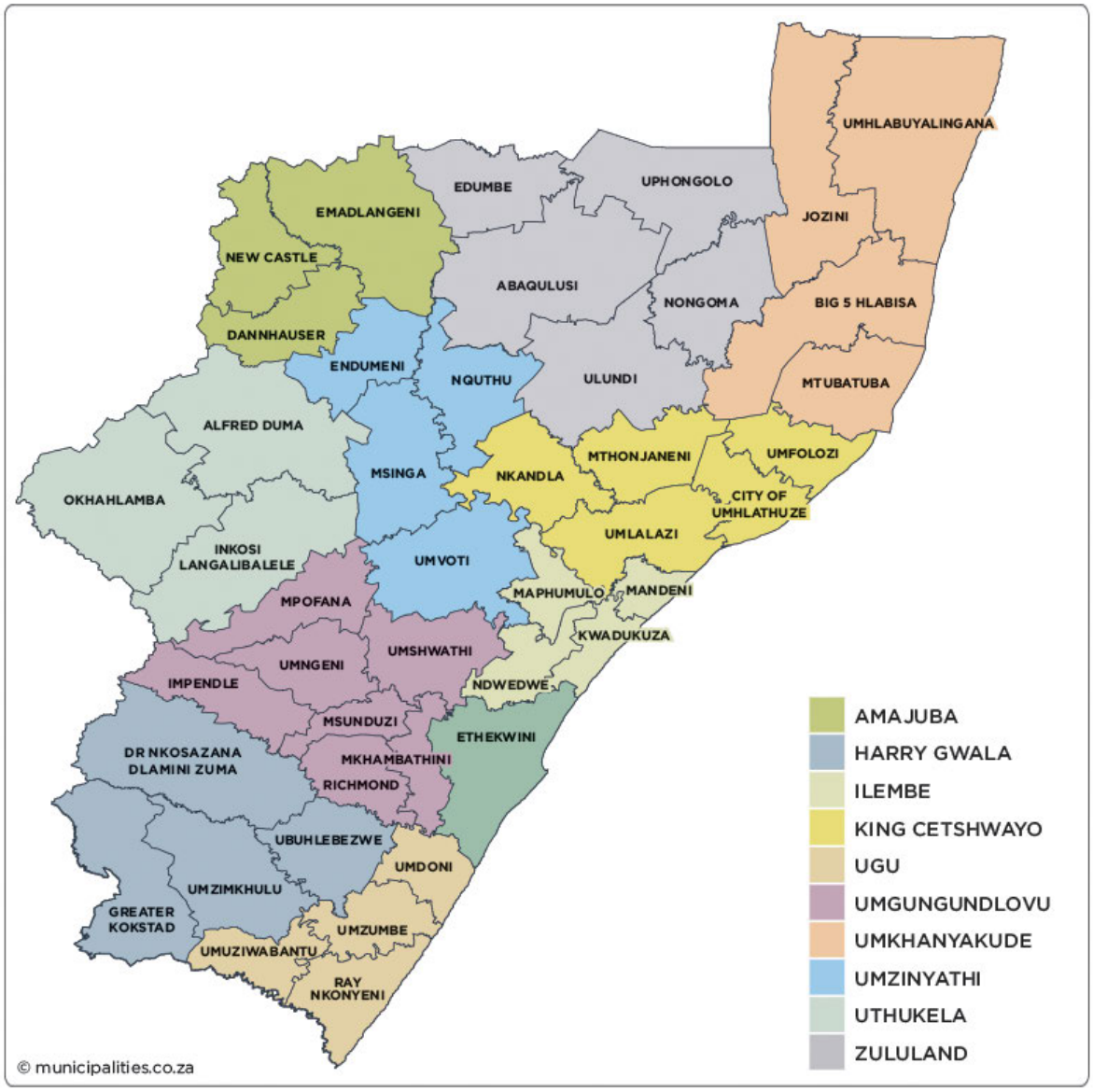

Figure 3.1 A map showing the subdivision of KwaZulu-Natal Province into the different districts (Yes Media , 2021)

3.4 STUDY POPULATION

To help answer the research objectives stated in Chapter 1 of this document, the population of interest for this study was defined as healthcare risk waste handlers in KwaZulu-Natal South Africa. To arrive at a suitable sample size; the HCRW handlers at the oldest operational treatment

plant servicing healthcare facilities in the province were selected. The plant has been in operation since 1998 and has over 500 employees across South Africa.

Within the company, the population of interest was further be classified according to the primary role that each employee is employed to do concerning health care risk waste management. Using an inclusion and exclusion criteria that are presented in the subsequent sub-section of this chapter, and the employee descriptors used by the waste handling firm; the following population of interest was arrived at, 15 Machine Operators, 67 Truck Drivers, and 85 Truck Assistants/General Labor, therefore the total sample size was 167.

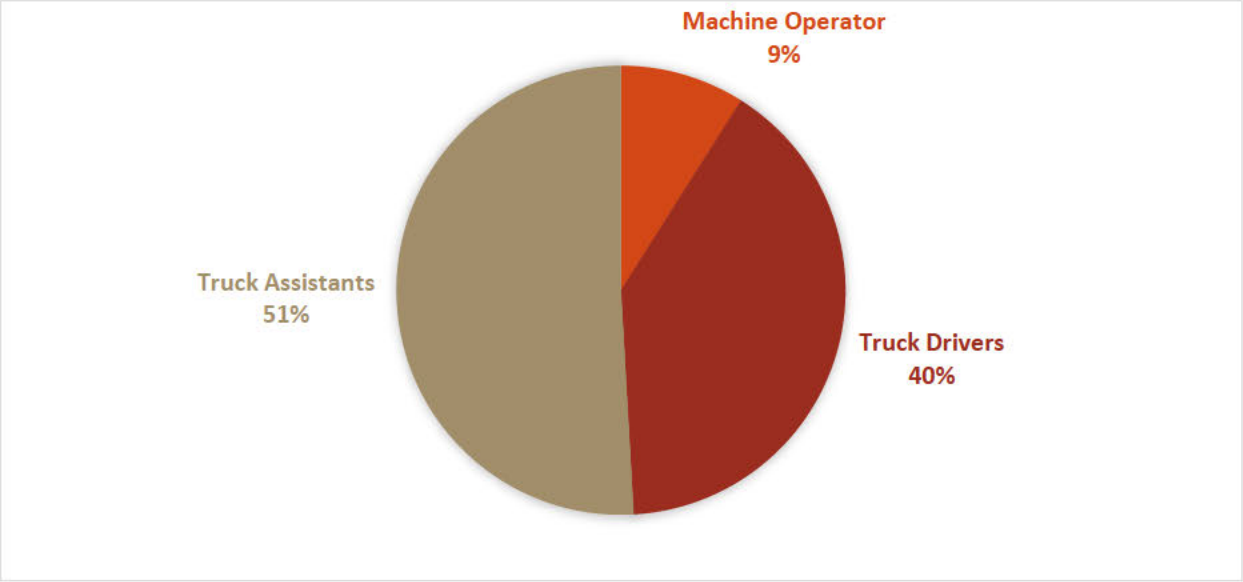

Figure 3.2: Population size sampled as provided by the statistician

3.5 SAMPLING

The study at hand employed the stratified simple random technique. Showkat and Parveen (2017) states that it involves the participants being divided into groups basing on certain aspects such as level of education and drawing from this population groups were based on their daily functions. This involves an increase in the accuracy of the results as strata are divided knowing that there must be heterogeneity. Showkat and Parveen (2017) point out that the stratified simple random ensures that each element under investigation faces identical chances of being selected. This is done after having grouped the population into sub-strata. A stratified random sample comprised of

Machine Operators, Truck Drivers, and Truck Assistants/General Labor were identified as the focal population of interest within the waste treatment facility, whose insights would help to shed light on the research objectives.

Recruitment of the research participants was conducted through a staff meeting that was facilitated by the treatment plant management which was held at the company premises. During the meeting, specific attention was given to drivers, driver assistants, and machine operators to ensure that they fully understood the purpose of the meeting and the study. As per the advice obtained from the statistician consulted, the researcher needed at least n=67 drivers; n=85 driver assistants, and n =15 machine operators to volunteer to take part in the research. Table 3.1 shows a summary of the statistician's report, which shows the required sample size together with the associated margin of error associated with the said sample size.

The duties of the truck drivers and their assistants are (not limited to, but inclusive of) to remove health care risk waste from the medical waste generators' central waste storage area. Thereafter the medical waste must be weighed; a waste manifest must be completed and signed both by the waste generator and the waste handlers collecting the waste. Finally, the waste is packed inside the truck, and transported to the waste treatment plant where it must be offloaded by machine operators who receive the waste offloaded from the truck and loaded into the treatment machines. Mechanical automatic machines are used within the treatment plant, however, there is manual handling of health care risk waste bags.

Post consultation with the treatment plant management, it was learned that within the treatment plant; these three groups of employees, (drivers, driver assistants, and machine operators) were the only ones that handled health care risk waste from the collection sites, road transportation to treating it in the treatment plant. Management staff, administration staff, and company representatives were never in danger of direct contact with health care risk waste during the execution of their occupational duties, hence the study did not focus on them. The researcher explained the research purpose in-depth to all employees and volunteers. A letter of information and a letter of consent were first explained in vernacular by the researcher to the targeted research population and emphasized that there will be no financial gains should they participate in the

research. Those who agreed to take part in the study were given an informed letter with a consent form.

Table 3.1 Summary of the statistician report on the required sample size for the study

Treatment plant population Group	Treatment plant population size [N=]	Minimum Required Sample [n=]	Confidence Level of Sample [%]	Margin of Error of Sample [%]
Drivers	88	67	95	5
Driver Assistants	100	85	95	5
Machine Operators	15	15	95	5
Total	203	167		

After the recruitment procedure was completed, the researcher went into different sections of the treatment plant, screening employees and verifying if the interested individuals fulfilled all the stipulated criteria. Voluntary participation was emphasized and those that met the criteria as detailed in the next sub-section of this report, were invited to participate in the study.

3.5.1 INCLUSION CRITERIA

The previous section of this chapter mentioned that the target population for this study was full-time drivers, drivers' assistants, and machine operators who were employed at the waste treatment plant during the data collection period of the research study (2020-2021).

- The second criterion, which builds from the aforementioned criterion, was that the respondent must have been a full-time employee and working for the company at least one shift per week for a period of a year and more.
- The study did include employees employed by the firm on a contract ("part-time') basis. From this group of respondents, the researcher selected only those part-time employees/ respondents who had been working for the firm under the said contract or a similar contract

for at least12 months and working at least one shift per week before the commencement of this study.

- These said measures were done for two-fold reasons. The first was to ensure that the researcher obtained the required sample size of the respondents while not compromising on the quality of the data collected. That is to ensure that only workers who had been "sufficiently" exposed to the occupational hazards of health care risk waste collection for a significant amount of time were assessed to try to minimize diseases acquired outside the occupational setting. A year or 12 months were defined as a long enough period.
- Lastly, selecting employees with 12 months or more occupational experience was done to ensure that workers were thoroughly accustomed to the practices of the firm to ensure that a fair response was obtained with regards to the firm's practices.

3.5.2 EXCLUSION CRITERIA

- Employees with less than one year in the treatment plant, regardless of whether they had been employed on a full-time basis by the company, were excluded from the study.
- The study also excluded office-based employees, management, administrative staff, and company representatives.
- The 10 participants from the pilot phase of this research study were also excluded from the main study and when drawing up results and conclusions based on this study
- All participants who refused to sign the consent form were excluded.

3.6 DATA COLLECTION

This section of the report details the data collection instrument that was used to gather data that the researcher used to draw insights into the occupational risk hazards experienced by the local medical risk waste handler populace, as well as into the prevalence of communicable disease within the said populace. This was done to help draw new insights into our research objectives stated in Chapter 1 of this report.

3.6.1 RESEARCH TEST INSTRUMENT

The research test instrument used to collect data was a hybrid adapted from ones used by Malebatja (2016) and Makhura, (2016) to investigate the "Knowledge and practices of health care workers on medical waste disposals at George Masebe Hospital, Waterberg District, Limpopo Province, South Africa" and the "Knowledge and Practices of Health care workers on Medical waste disposal in Mapulaneng Hospital in the Ehlanzeni District of South Africa", respectively, locally. Internationally the research test instrument has been used in literature to help study the management of medical waste in the main hospitals of Yemen (Al-Emad, 2011).

The test instrument which is contained in the Appendices (E and F) of this report was adapted to answer the research objectives while also keeping the length of questions short, the layout simple, and logical; to aid comprehension of the test instrument and obtain a high response rate to all the questions.

The test instrument was divided into four main sections that are: Section A, Section B, Section C, and Section D.

Section A, which contained a total of 7 closed-ended Questions, looked to capture the demographic data of our sample population to better frame and compare our research findings.

Section B contained a total of 5 questions, composed of two open-ended questions and three closed-ended questions. This section of the test instrument aimed to capture the risk waste handler's knowledge and awareness concerning waste management. Using a similar research test instrument, (Al-Emad, 2011) was able to conclude that the relatively high proportion of waste-worker injuries, just less than 30% as compared to other developed countries which record injuries just below 2%; could be attributed to a lack of training in procedures of collecting and disposing of medical wastes and an absence of supervision in the surveyed hospitals.

Section C made up the bulk of the research Test instrument. It was composed of 19 closed and open-ended questions relating to risk waste handlers' knowledge and awareness about handling healthcare risk waste. For example, Questions 26, 27, and 28 tried to determine the prevalence of communicable diseases within the research sample. Question 26 was a closed-ended type question that asked the respondents whether they had experienced any form of aliment since working for

the company. Three response choices were suggested for the research participant, 1. Yes, 2. No, and 3. Not sure. Question 27 looked to dig deeper by trying to determine the nature of the ailments suffered by the employee during their course of employment with the firm. Here the research respondents were again provided with a list of multiple choices from which, unlike the previous question where only one response was valid namely, mutually exclusive events, here the response set was mutually inclusive. Respondents were tasked with selecting all the aliments with which they had been diagnosed since working for the firm. A note was also added to the question in parenthesis which emphasized that the research respondents could choose more than one choice from a list of choices; together with an option of listing other diseases not presented. The set of responses for the question was composed of those communicable diseases that were found to be the most prevalent among health care waste workers as found and presented in the literature review in Chapter 2 of this report. This was done to ensure that comprehensive data was captured which could use to draw inferences and paint a picture of our population of interest.

The last section of the test instrument consisted of only four questions; three of which were of the closed-ended type where the respondents were required to state the degree to which they agreed or disagreed with a given statement posed on the question. It was felt that the respondents needed to feel that the progress was being made with the answering to ensure the completion of all the questions. For example, Question 31, asked: “Do you think that your employer is doing enough in providing a safe work environment?”

Question 32, the second question in the section contained the only open-ended question in the section where the respondents were required to voice out their suggestions or comments on improving the safety of the workplace. It was hoped that valuable themes about safety improvement measures from the view of the final human agent in the cradle to the grave cycle of risk waste could be captured.

3.6.2 PILOT TEST

To pilot the research questionnaire and obtain valuable feedback before proceeding further with administering the questionnaire to the sample population; three key stakeholder groups were identified by the researcher and administered the research questionnaire before it was finally administered to the sample research population.

The first of these stakeholder groups was fellow academic persons (the study supervisor and two other academic department staff), whose main aim was to check the correctness and validity of the test instrument. This ensured that the test instrument could be as error-free as practically possible, and also that it provided the researcher with the required information necessary to answer the research objectives stated in Chapter 1 of this report.

The second group which received the test instrument before it was administered to the target population; was the institution heads of the waste collection company and the supervisors of the health care risk waste handlers.

Finally, to tailor and ensure the appropriateness of the research instrument, the test instrument was administered to 10 participants who were not part of the population sample size. This was done to improve the quality of the research instrument. Results from all three stakeholders revealed that three questions needed to be restated in a manner that the target population could more readily comprehend and respond to. Feedback from this pilot study group was then incorporated into the final test instrument that was administered to the final sample study population. Piloting the test instrument to a sample of the target research population indicated that the research test instrument was both valid and reliable to help answer the research objectives at hand.

The following amendments were made to the final questionnaire:

Question 18 of the test instrument was changed both in wording and structure. From being an open-ended question, which read “Elaborate or name the control measures” To a closed-ended question reading, “Tick the PPE you have been provided with”. The pilot participants suggested an open-ended question would take too much of their time at work in responding to the question. Hence, the latter form of the question was used for the main study.

In the closed-ended form of the question, stated in the foregoing paragraph, respondents were given a list of six personal protective equipment items, which were formulated using the response from the pilot group, of the items most likely to be used by the study population. It is to be noted here that an option of "other" was added to the list to make room to capture any other personal protective equipment items that were not provided for, from amongst the six options conceived of during the pilot phase of the study.

Finally using the feedback received from the pilot study, Question 29 and Question 30 were furnished with an extra option for the respondents to select, namely, "Not Applicable". No further edits were necessary to the test instrument and the test instrument was deemed adequate for the study.

3.7 RELIABILITY AND VALIDITY

3.7.1 VALIDITY

Reliability in social science research is concerned with the consistency of a measure, and validity is about the accuracy of a measure. Validity refers to the degree to which a study accurately reflects or assesses the specific concept that the researcher is attempting to measure (Brink, van der Walt and van Rensburg 2018: 205). To ensure validity, the researcher used a previously tested, used and validated questionnaire. Adaptations of the test instrument have been successfully used in literature within the local South African context to gauge the knowledge awareness and practices of healthcare workers within the various sub-sectors of the South African health system (Makhura, 2016; Malebatja, 2016). Content validity was ensured by making sure that the aim and objectives of the study are clearly defined and presenting the proposal to the supervisor and peers. The questions on the questionnaire were phrased appropriately to ensure that the questionnaire measures what it is intended to measure.

3.7.2 RELIABILITY

Reliability was ensured by testing the questionnaire on 10 participants who were not part of the major study. The questionnaire was given to the participants to give comments on the clarity of the questions and necessary corrections were amended on the questionnaire.

3.8 DATA ANALYSIS

The data that was captured by the test instrument was, with the help of a statistician, coded and uploaded directly onto the International Business Management Statistical Package for Social Sciences 22.0 (IBM SPSS 22.0). This software has been successfully used by Al-Emad (2011); Makhura (2016); Malebatja, (2016); Mdlozini (2015), in similar studies.

Using descriptive statistics techniques, the results drawn from the test instrument were summarized and important statistical features of the data were highlighted. The descriptive statistical analyses are shown or summarized in graphs, tables and charts as presented in Chapter 4.

3.9 ETHICAL CONSIDERATIONS

The term “ethics in research” refers to the quality of research procedures to their adherence to professional legal and social obligations to the research subjects (Alasutari, Bickman & Brannen., 2008).

3.9.1 PERMISSION TO CONDUCT THE STUDY

The ethical clearance for this study was first obtained from the Durban University of Technology (DUT) Institutional Research Ethics Committee (Appendix G).

Gatekeeper permission was requested and obtained from the waste treatment plant Chief Executive Officer through to the SHERQ manager (Appendix H).

3.9.2 OBTAINING INFORMED CONSENT

Employees were informed of voluntary participation and letters of information and consent forms (Appendices B, D) were provided to all participants to ensure that there are not forced and that they understand the reasons for the study. An informed consent form was given to participants prior to data collection. They were assured about the confidentiality of the information they will give. Participants signed the consent forms which were detached from the questionnaires and kept separately so that the questionnaires could not be linked to any specific person.

3.9.3 SAFEKEEPING OF INFORMATION

All data collected will be securely stored in a cupboard for five years and thereafter disposed. The data is only accessible to the researcher and supervisor. All electronic information will be password protected and accessible to only the researcher and supervisor. The only other person who had access to the completed questionnaires, apart from the researcher, was a statistician who transferred data to the SPSS software computer program. These will be discarded after five years through shredding of hard copies and deleting of the soft copies.

3.9.4 ANONYMITY AND CONFIDENTIALITY

Questionnaires were completed by the participants; however, in some cases, the researcher assisted participants who were not confident in their comprehension or some cases their writing skills. Prospective respondents were addressed as colleagues in the letters of consent and no names were indicated as the letters were delivered by hand on the day of the data collection. This measure was done to ensure the anonymity of respondents as well as confidentiality. Further, the research questionnaire was administered in a quiet setting to ensure that the respondents felt safe and comfortable responding freely and openly. Anonymous; codes were used throughout the data collection period of the study to identify participants. Three unique alphabets were used to group the respondents into their occupational duties. A unique random running count number was then attached to each of the respondents to help the researcher ensure that they obtained at least n=67

drivers; n=85 driver assistance and n =15 machine operators as per the advice of the statistician. Example

A = Drivers

B= Driver assistances

C = Machine operators

Therefore, a code of say" C5", means the response of the 5th machine operator.

In this way, the researcher ensured the anonymity of the respondents while systematically keeping track of the data gathered.

3.9.5 FAIRNESS AND JUSTICE

The questionnaires were written in both IsiZulu, (which is the local vernacular) and English. The translation was done by a qualified translator. KZN is dominated by Zulu-speaking citizens which is why the original English questionnaire was translated to IsiZulu.

3.10 CONCLUSION

In this chapter, the study design employed to answer our research objectives has been discussed. In doing so, a brief discussion on the study location was first presented. This was done for twofold reasons. The first was to frame the significance of the study and the second was to highlight how a suitable study population was arrived at by the researcher. The sampling procedure as well as the ethical clearances required, obtained, and practiced by the researcher in conducting the research were presented. A presentation on the data collection procedure and instrument then concluded the chapter.

In the next chapter, Chapter 4, the results of the statistical analysis performed on the data collected are presented. The subsequent chapter thereafter presents a discussion of the results in light of the research objectives stated in Chapter 1 of this report

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

A total of 167 completed research questionnaires were collected from the sample population. The results of the findings are presented in this chapter. This chapter is broken down into four sections as per the research test instrument structure. Section A presented the demographic profile of the respondents, Section B captured the awareness and knowledge about waste management, Section C aimed to capture the waste handlers' awareness and knowledge about handling health care risk waste (HCRW). The last section of the test instrument then aimed to capture the general attitudes of waste handles concerning their occupation. The summaries of the results are as follows:

4.2 SECTION A: DEMOGRAPHIC PROFILE OF THE SAMPLE RISK WASTE HANDLERS

Of the n=167 responses obtained from our sample, 95% were male and only 2% presented female participants.

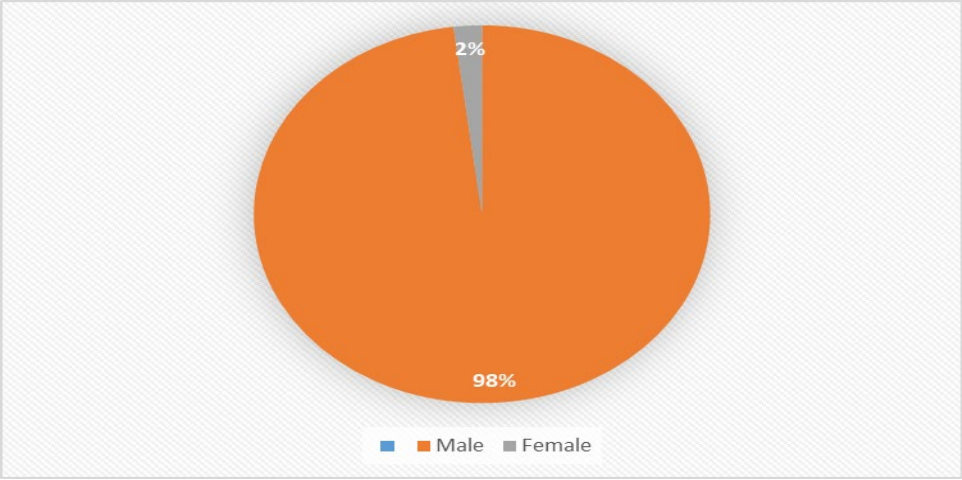

Figure 4.1: showing gender results

2.9% of the sampled participants chose not to indicate the highest formal schooling obtained. Highest response were 103 participants who indicated to have obtained Matric level, making up 61.6% of the sample population. 41 or 24.5% had secondary education and only 11 indicated that they had Diploma 6.5%. 7 participants had ABET resulting in 4.1% (Graph rounded off to the nearest 10)

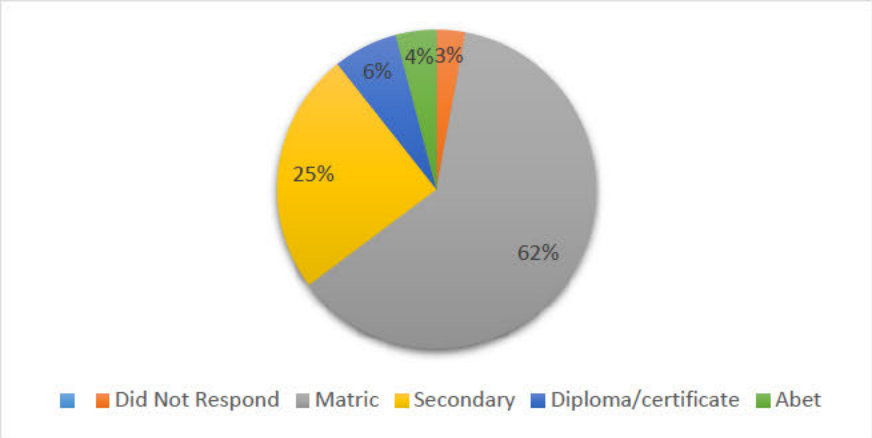

Figure 4.2: showing results of educational level

The majority of the sampled population was between the ages of 31- 40, they presented 52.6% followed by the age group of 41- 50 which was 26.3%. 17.3% was of the age 21 to 30, 7.1% from the age group of 51 to 60 and 61 to 65 was 1.7%.

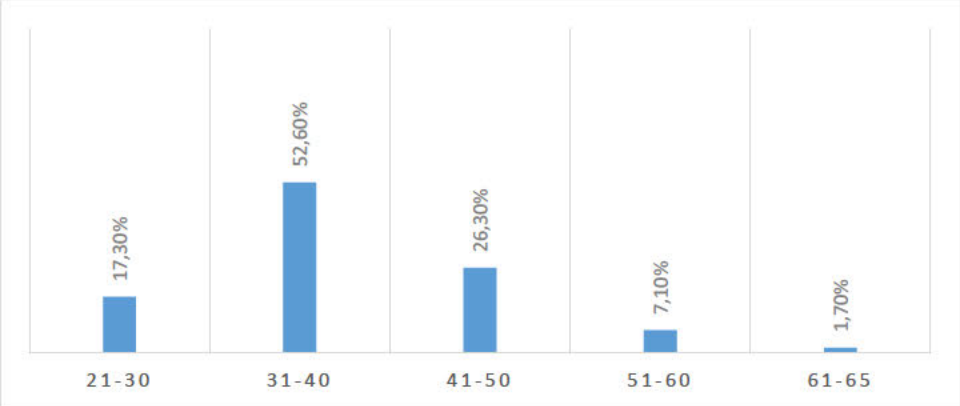

Figure 4.3: showing age groups results

The sample population comprised 97% black Africans, with the 3% choosing not to indicate their ethnicity.

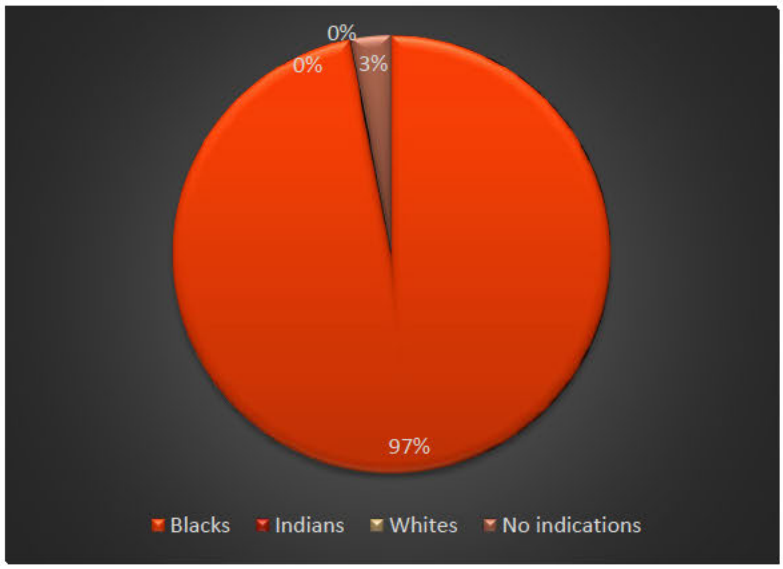

Figure 4.3: result of ethnicity group

Employment Status resulted with 62.9 % of participants who were employed part time and only 4.8% were full time employed. 32.3% was a result of contract workers. (graph rounded off).

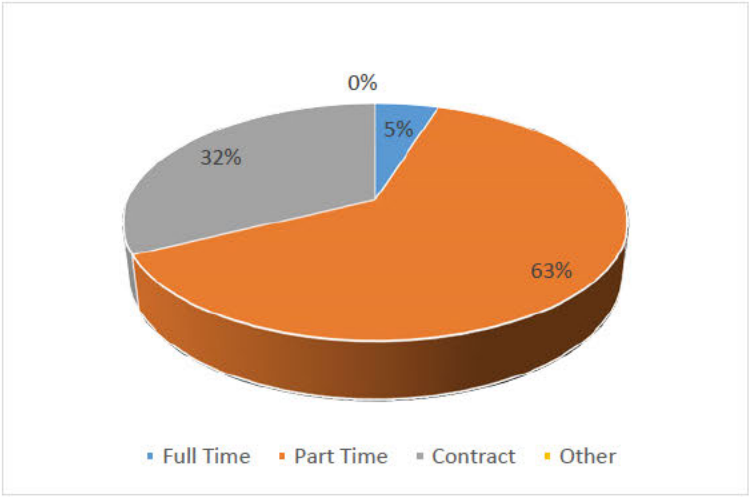

Figure 4.4: Employment status results

Employment service has been observed lowest 1.1% in the 20 years and more, followed by 3.6% from the 16 to 20 years. The highest results were 59.8% observed from the 1 to 5 years of work period, 6 to 10 years was the second highest with results of 29.9%. 5.6% was presented in the 11 to 15 period of employment.

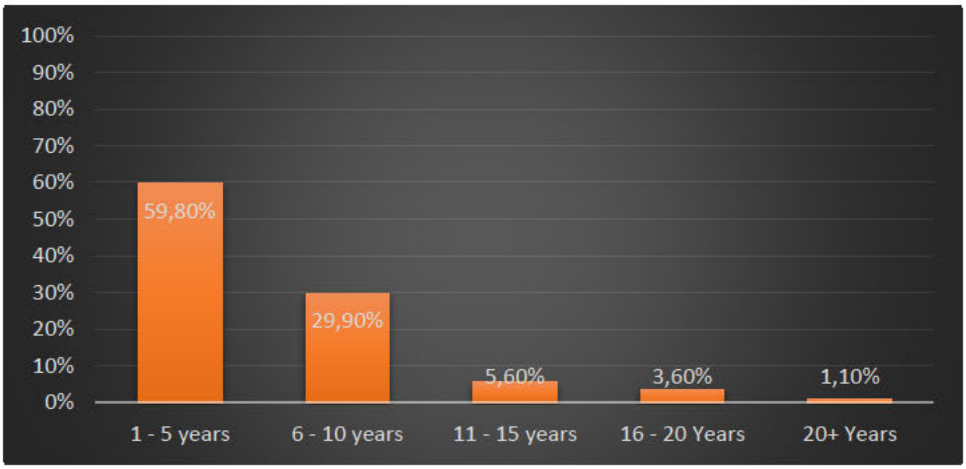

Figure 4.5: employment service results

A total of 56.8% respondents indicated that the average amount of shifts they worked per week was between 3-5 days a week. (24.5%) of the respondents works 5 to 6 days a week while those who work the whole week were (17.3%). The least worked days of the week was 1 to 2 day worked by (1.4%).

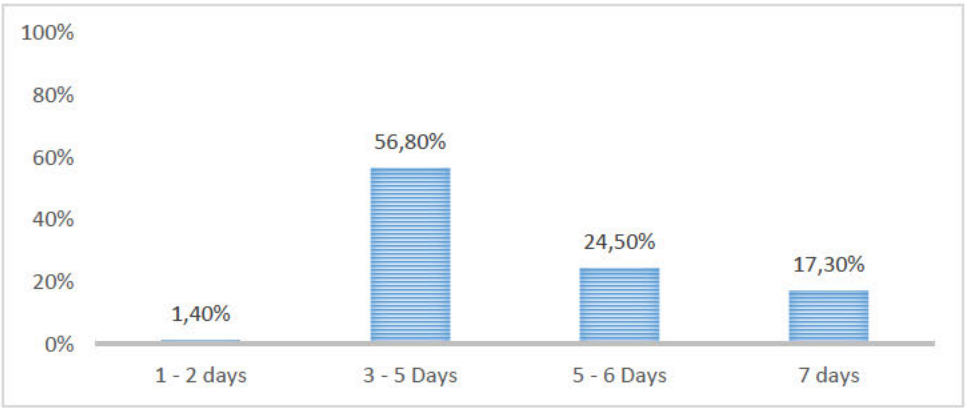

Figure 4.6: shifts per week

4.3 SECTION B: AWARENESS AND KNOWLEDGE IN RELATION TO WASTE MANAGEMENT

Section B of the data collection tool was observed to assess the awareness and knowledge of the health care risk waste handlers in relation to waste management in general.

An open-ended question [Q8] enquiring about the respondents understanding on waste management was broken down to 7 stages according to the participants' responses

Table 4.1 knowledge to waste management: Grading used to assess the waste handlers' levels of comprehension on waste management

Theme number	Description
1	Handling Waste without causing hard to other people and the environment
2	Daily operational activities associated with health care risk waste management
3	Physical waste handling activities of medical risk waste management
4	Transporting and storage activities of medical risk waste management
5	Treatment and Disposal activities of medical risk waste management
6	Not relevant answers/ not sure
7	No response

Understanding of waste management was present by comprehensive knowledge on waste management practices 79%. Partial understanding was 57% and 5% were of no response while the participants that showed no knowledge or unsure were 33%.

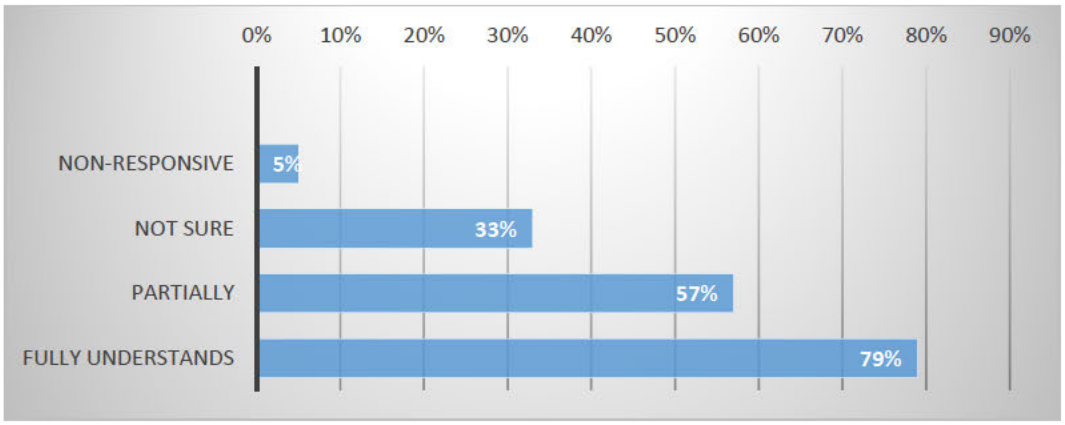

Figure 4.8: HCRW handlers understating of waste management

The stratification of job titles was found to be structured as shown in figure 4.9. 167 respondents, n= 67 (40%) were Drivers, n=85(51%) were driver assistants/general workers, and n = 15 (9%) were machine operators.

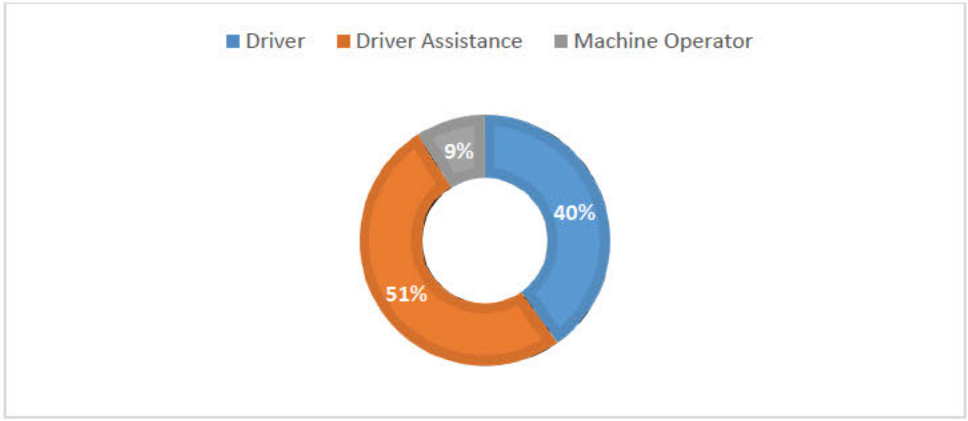

Figure 4.9: Roles of the targeted study groups

92% strongly agreed to have received training and 88.6 % strongly agreed that the training was clear and brief. 6.4% just agreed into have received training and 9.4% just agreed to the trainings that were clear and brief. 2% of not sure participants in both the Q10 If training was received and Q11 stipulating if the training was clear and brief.

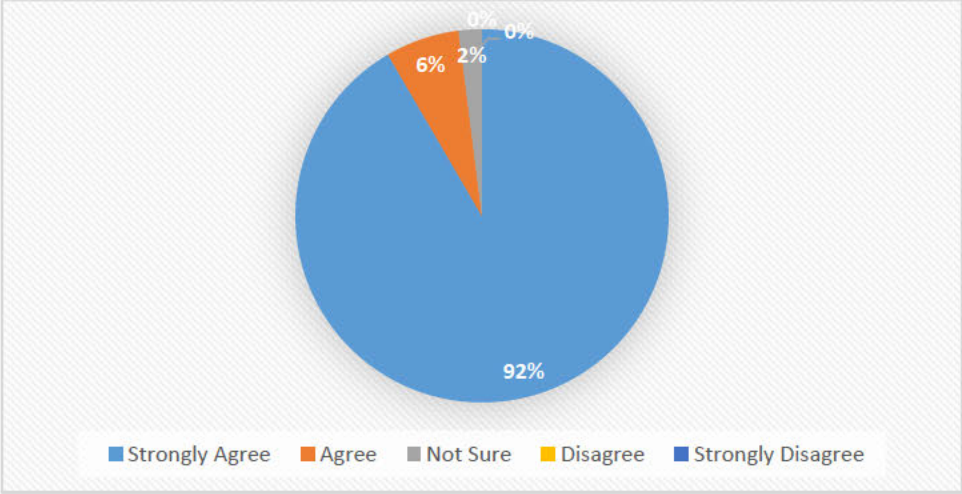

Figure 4.10: WM training received by HCRW handlers

Question 11 sought to know whether the training received was clear and brief, 88.6% strongly agreed to the question, there were 0% of strongly disagreements and disagreements. 9.4% agreed to the question and only 2% were not sure.

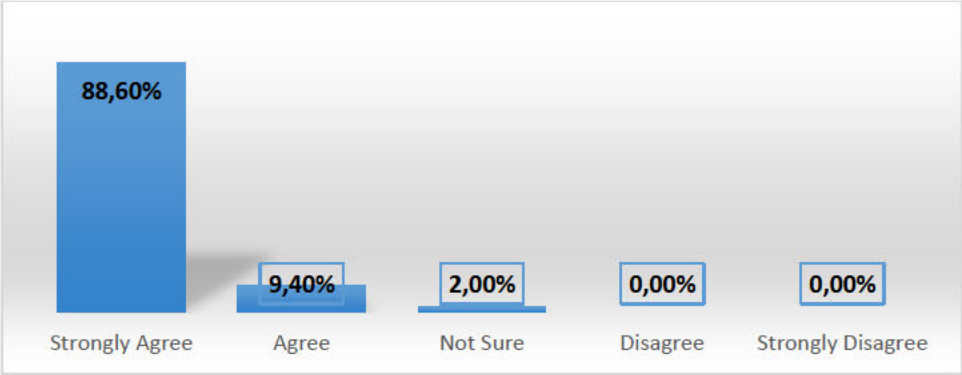

Figure 4.11: Results showing whether the WM training was clear and brief

91% revealed that they strongly believe that health care risk waste is hazardous, leaving only 3.7% who just agreed, however there is 5.3% of resulting showing participants who were not sure whether HCRW is hazardous or not. (Graph % are rounded off)

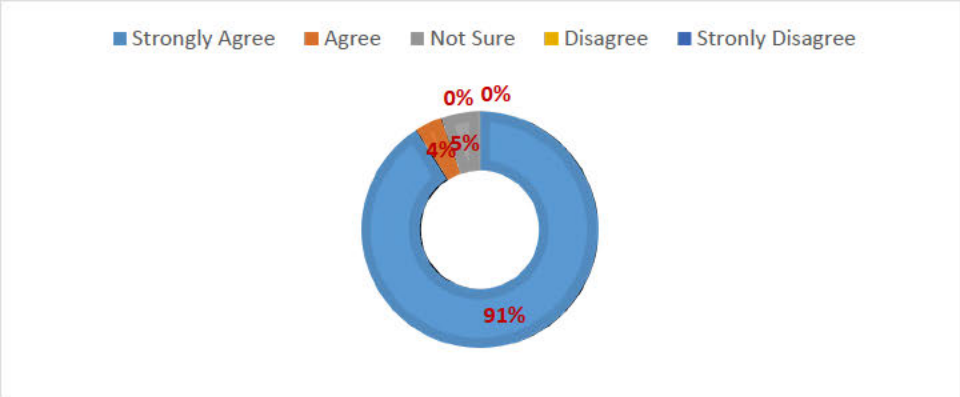

Figure 4.17: Results showing if HCRW handlers believed that HCRW is hazardous

4.4 SECTION C: AWARENESS AND KNOWLEDGE IN RELATION TO HANDLING HEALTHCARE RISK WASTE

[Q13] asked the respondents whether they had received training on handling healthcare risk waste. Of the administered test instruments, n=157 (94.0%) were strongly agreed responses. Resulting in 5.4% who also just agreed and 0.6% of not sure participants

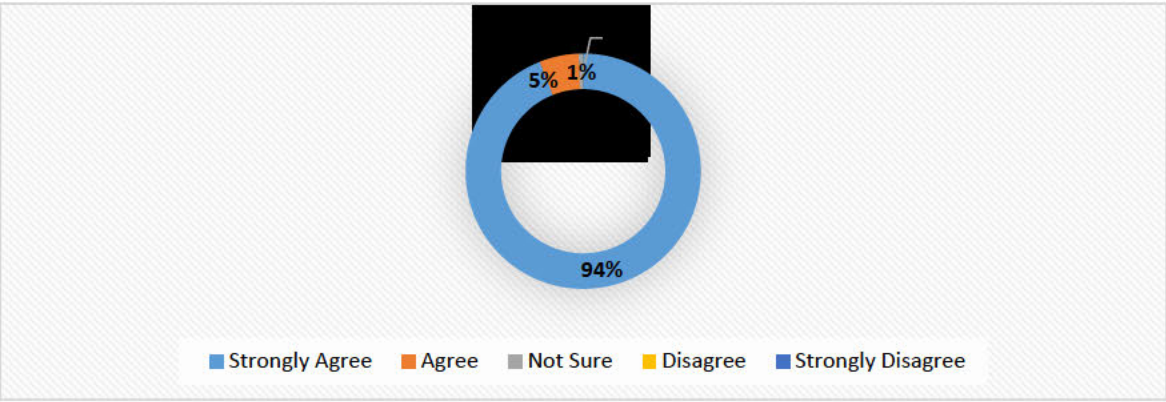

Figure 4.8: HCRW training receive results (Rounded Off)

The subsequent question, [Q14], then asked whether the respondents found the training relevant to their daily duties, n=159 (95.2%) responses were obtained as strongly agreed. 4.0% also just agreed making 0.8% of not sure participants.

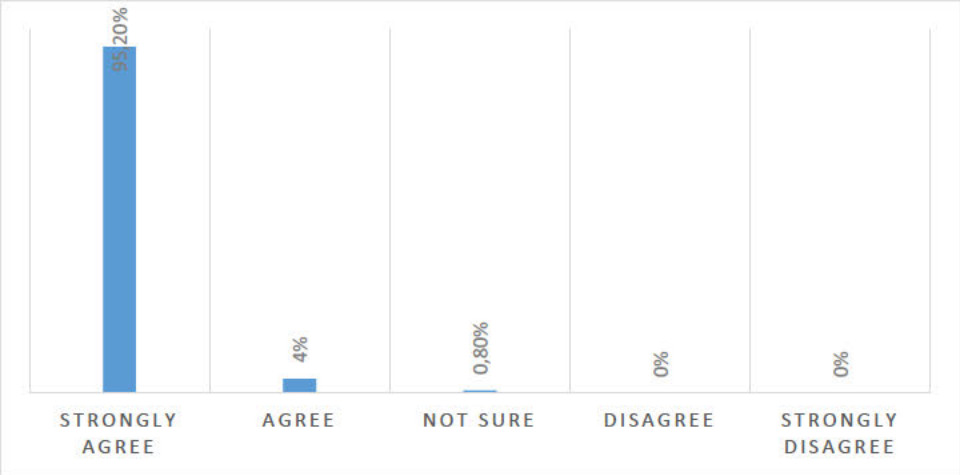

Figure 4.14: relevancy of the HCRW training received

Respondents were also asked, [Q15], whether health hazards were communicated to all staff by the employer. A total of n=161 (96.4%) responses were obtained as strongly agreed, and 4.8% respondents indicated to just agree.

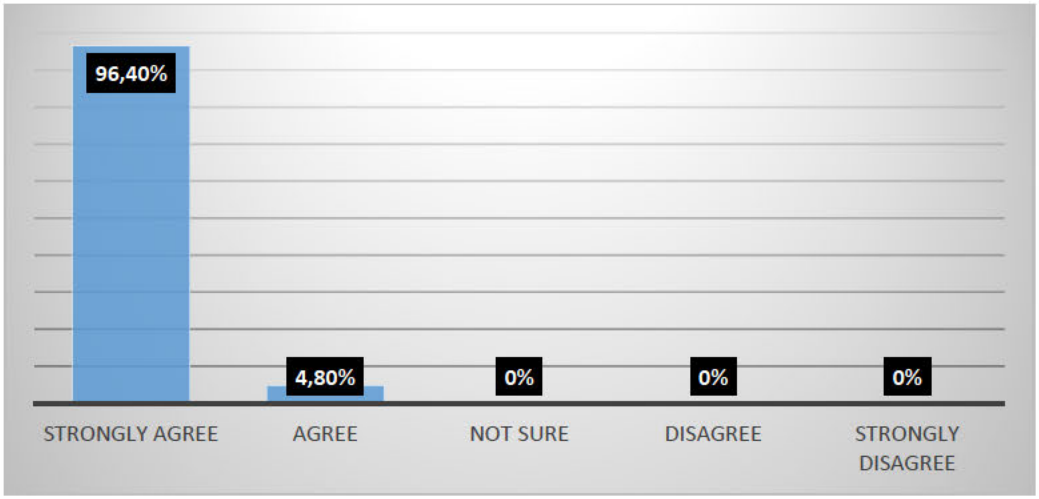

Figure 4.9: communication of Health Hazards when handling HCRW

Question [Q16], sought to understand whether the respondents understood that handling medical waste can expose them to communicable diseases. A total of n=160 (95.8%) strongly agree responses were obtained, leaving 4.2% who also just agreed.

Figure 4.10: results showing if exposure to HCRW could expose one to communicable disease

[Q17] determined whether the respondents were aware of any occupational risk control/protective measures in place. A total of n=161, (96.4%) responses strongly agreed. Only n=6 (3.6%) of the respondents indicated to disagree that protective control measure in place.

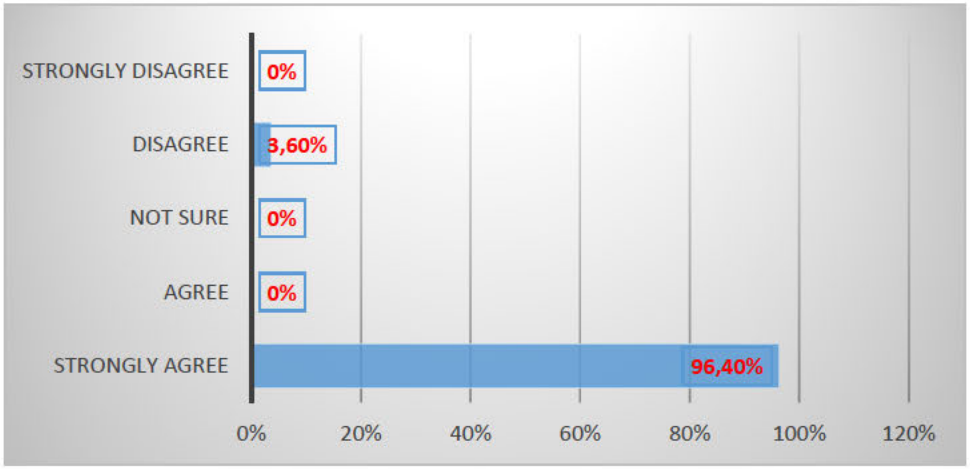

Figure 4.11 graph showing the provision of PPE

Respondents were then asked, [Q18], to tick from a given list, of personal protective equipment which they had been provided with. An empty response (no tick) was interpreted as an indication of not having received that particular item of personal protective equipment. Respondents also had the option of indicating an unlisted item of personal protective equipment item not given in the

list, under the box "Other, name the other". The question received n=163 (97.6%) responses of at least more than one provision of PPE.

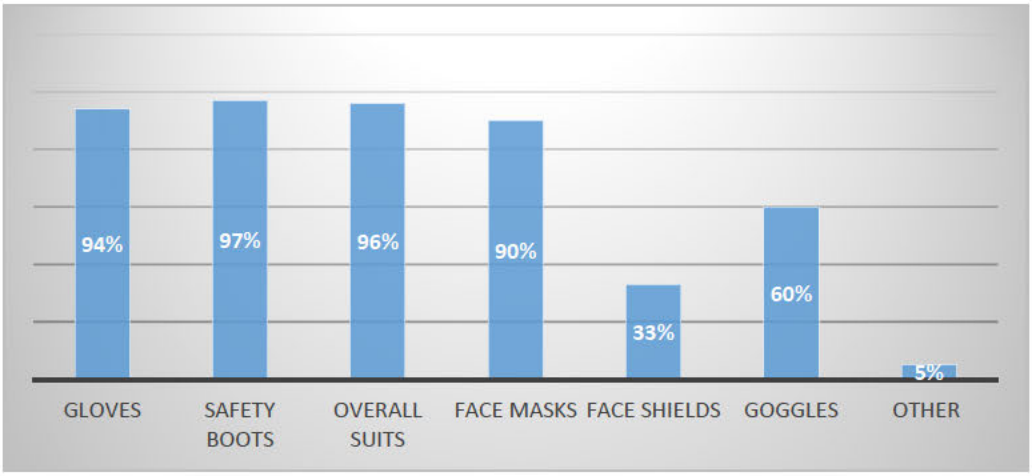

Figure 4.12: types of PPE provided

The subsequent question after [Q18] looked to determine whether respondents believed that the control measures in place were effective. A total of n=155(92.8%) responses were in strong agreement. 2% just agreed, leaving the 5.2% to disagreement.

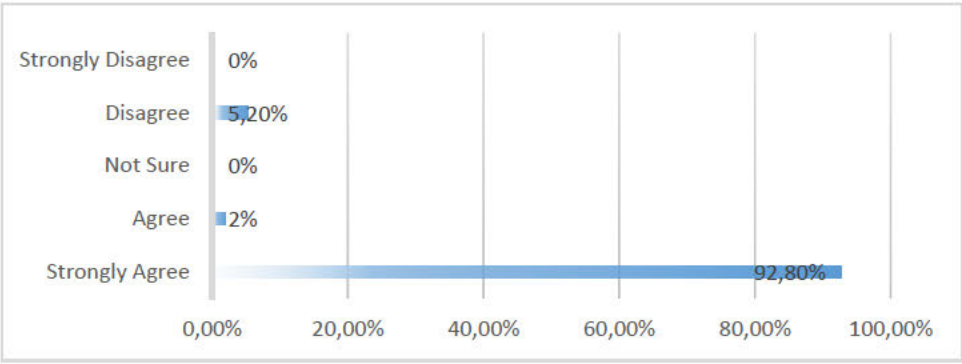

Figure 4.13: results showing effectiveness use of PPE

Focusing on capturing the respondent's attitudes towards the use of personal protective equipment, [Q20] first asked whether the respondents were provided with personal protective equipment. 144 (86.2%) strongly agreed, 5.5% just agreed and 8.3% disagreed to the PPE provision.

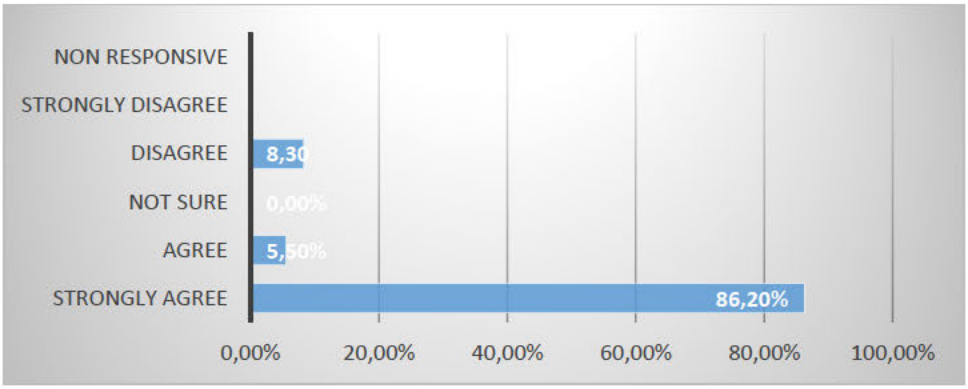

Figure 4.14: Individual provisions of PPE

[Q21] then followed up by asking whether respondents used personal protective equipment all the time when handling medical waste. A total of n=159 (95.2%) responded as strongly agreed, only n=8 (4.8%) respondents chose not to indicate their responses (or spoilt their responses).

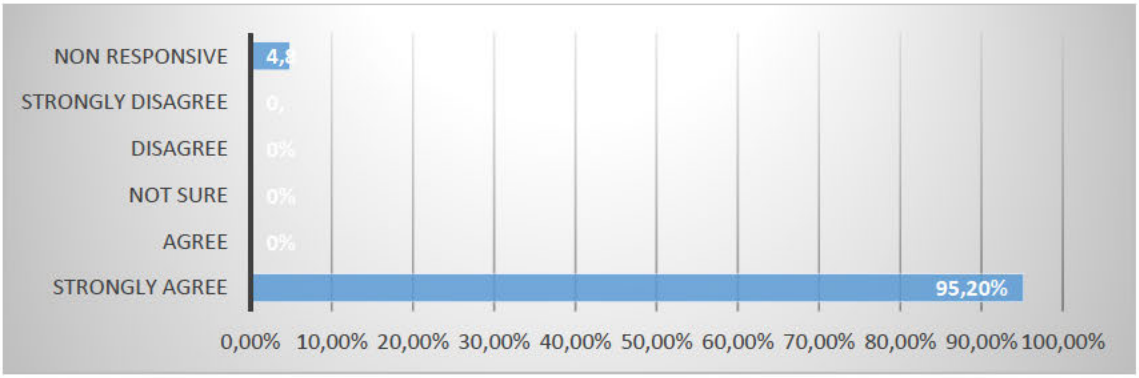

Figure 4.15: use of PPE when handling HCRW

To determine the knowledge of the respondents with regards to handling healthcare risk waste; [Q22] followed up by asking whether the respondents thought that personal protective equipment should be used when dealing with medical waste. A total of (95.8%) strongly agreed, (3.6%) respondents indicated that they disagree leaving only 0.6% who just agreed.

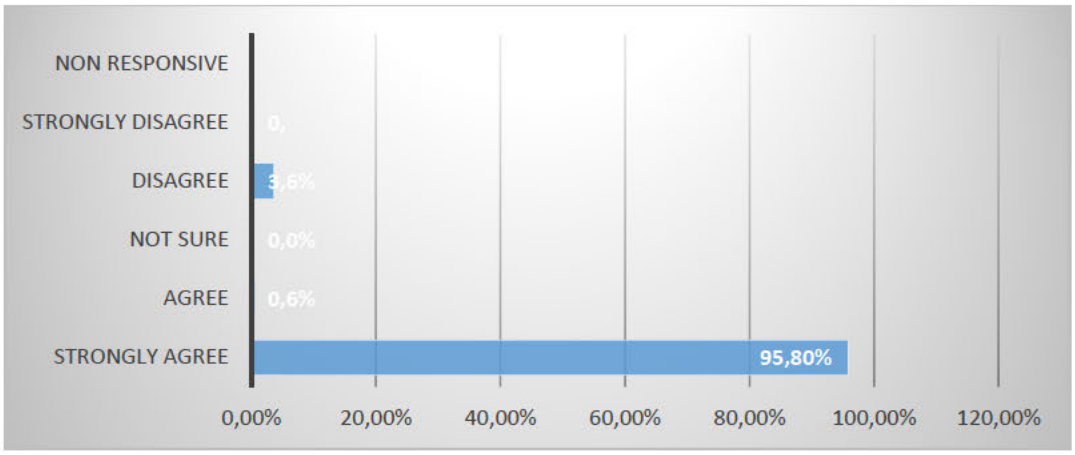

Figure 4.16: Attitude towards using PPE when handling HCRW

Question, [Q23], then looked to capture the respondent's attitudes toward the effectiveness of personal protective equipment. It asked the respondents to indicate whether they believed that personal protective clothing was effective? Respondents could choose to either: strongly agree; agree; not sure, disagree, strongly disagree. A total of (88.4%) strongly agreed. 0.8% just agreed and 4.8% were not sure and 6% disagreed.

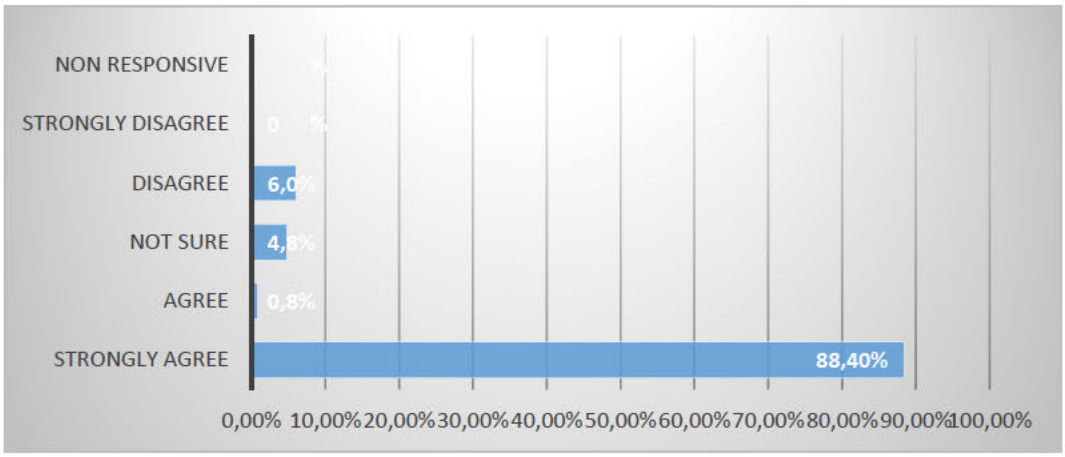

Figure 4.17: protection attitude when using PPE

The hepatitis vaccination history of the sampled population was then inquired about, [Q24]. A total of (4.6%) of the total respondents chose not to indicate their vaccination history. (82.2%) indicated in strong agreement to have received a hepatitis vaccination in their life. (2%) were not

sure, and (11.2%) said that they strongly disagreed to have previously been vaccinated for hepatitis.

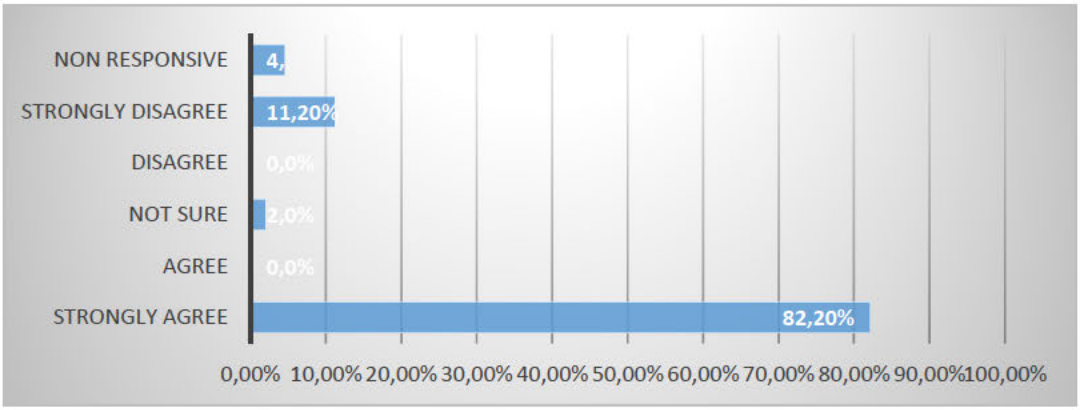

Figure 4.24: Hepatitis inoculation received by HCRW handlers

To get a better understanding of the respondents' hepatitis vaccination history, [Q25], then proceeded by requiring the respondents to indicate when last did they received a hepatitis vaccination. Respondents could select a period from a list of five choices. That is respondents could either indicate that they had been vaccinated: within a year; between 5 years; more than 5 years; never, or do not know. Findings were as presented in figure 4.25.

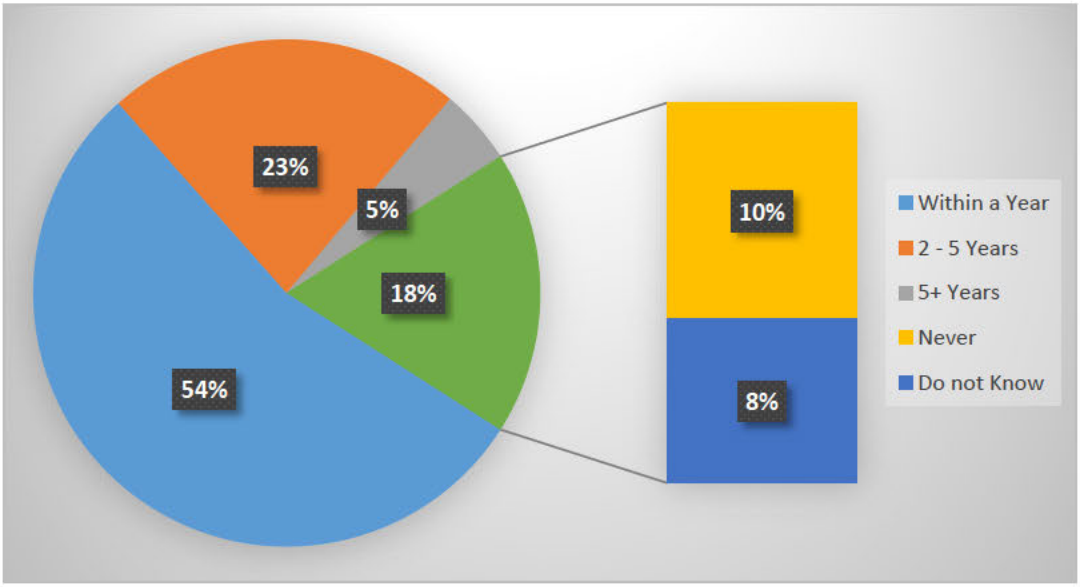

Figure 4.18: Last hepatitis inoculation received

Focusing on the medical history of the respondents, the test instrument, inquired whether the employees had ever experienced an illness since they had started working for the company. Three options were given to the respondents; that is the respondents could either indicate that they had been sick, not sure, or had never been sick since working as a waste handler. The response was almost exactly split in the middle, (49.1%) of the respondents indicated that they have suffered from an illness since working as a HCR waste handler and (49%) indicated that they have not suffered from any illness since working as a HCR waste handler living 1.9% who were not sure.

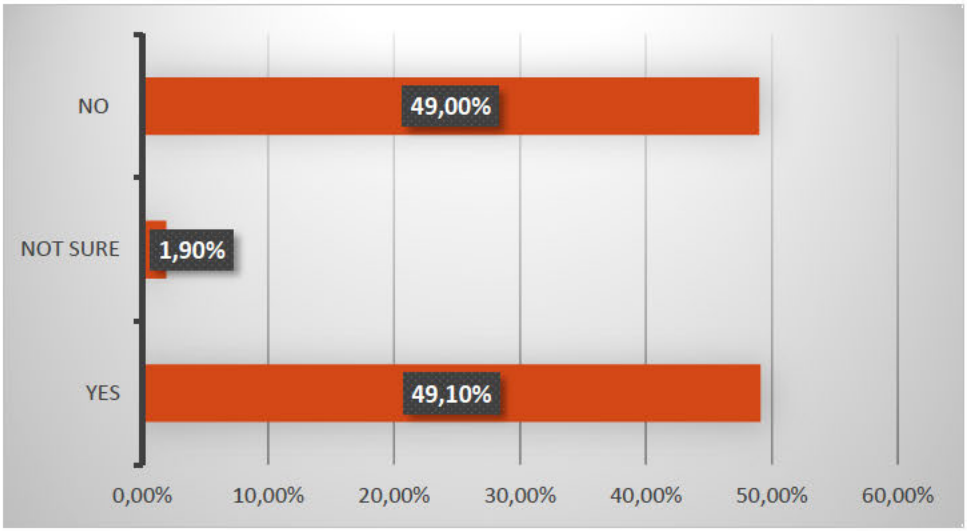

Figure 4.19: Prevalence of employees who have suffered from illnesses since they started working as a risk waste handler

Figure 4.27 shows the response summary of the disclosed illnesses that the respondents had suffered from since they had started working for the company. (42.2%) of the sample population indicated that they had been diagnosed with a cough, (10.8%) indicated that they had suffered from a skin rash, and (2.3%) suffered from TB while (7.2%) indicated that they had suffered from hepatitis. No respondent indicated that they had contracted HIV since working as a waste handler. 37.4% did not respond to the question or ticked other without indicating the other diseases.

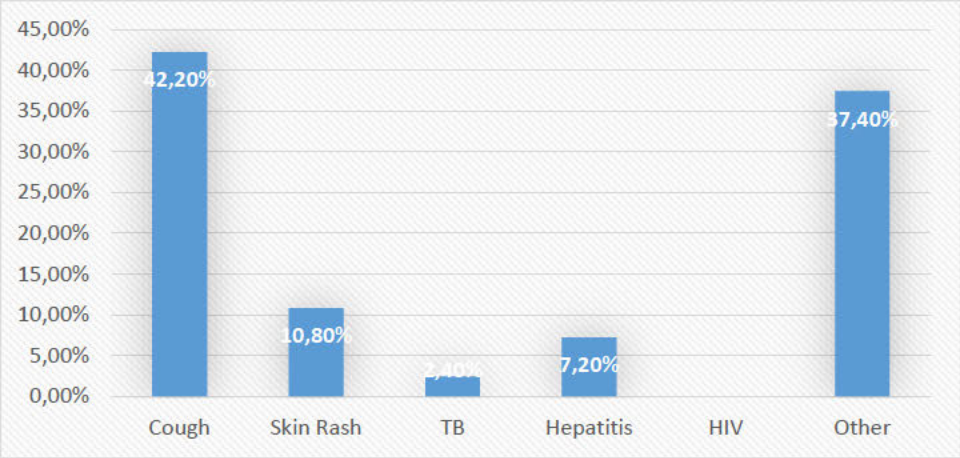

Figure 4.20: Summaries of diseases waste handlers have been diagnosed with

The test instrument then required the respondents to simply state whether had they ever suffered an injury as a direct result of waste handling activities. The response to the question is summarized in figure 4.28. A total (44%) indicated being injured at work, (50.6%) never been injured and 5.4% indicating that they were not sure.

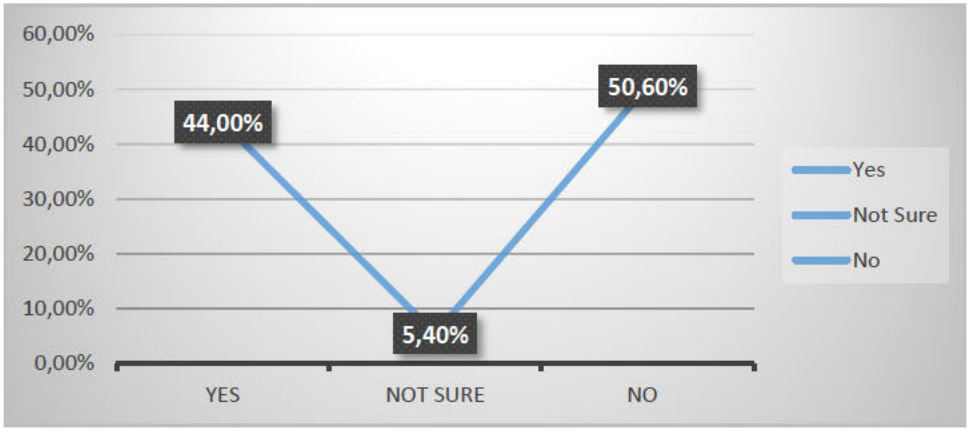

Figure 4.21 : Results of HCRW handlers injured from handling waste

[Q29] asked the respondents to indicate the nature of the injury or incident that they had experienced while carrying out their waste handling responsibilities. Figure 4.29 shows a summary of the response to the question. Data revealed that the most frequently occurring incident was needle stick injuries by (54%), followed by (33.7%) who had contact with waste fluids the third most selected incident was blood splashes at (10.3%) and the 2% indicated as not applicable

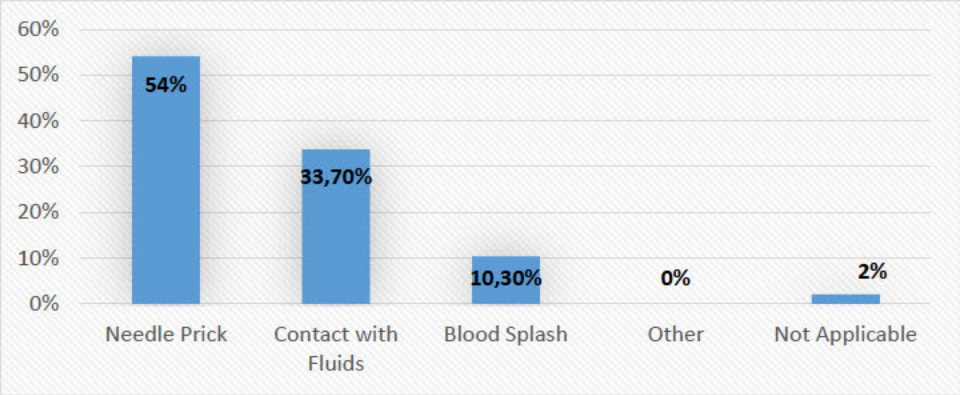

Figure 4.22: Nature of the occupational related incident or injury experienced

Building on the former question; [Q30] then asked the respondents to indicate if they had visited a doctor or a clinic post the occupational incident which might have exposed them to communicable disease. A total of (52.9%) indicated that they had sought professional medical attention post the incident that exposed them to HCRW, while (35.3.0%) said that they chose not to seek medical attention post the said incident. 5% were not sure as they could not recall and 7.1% indicated the question as not applicable. Figures rounded off.

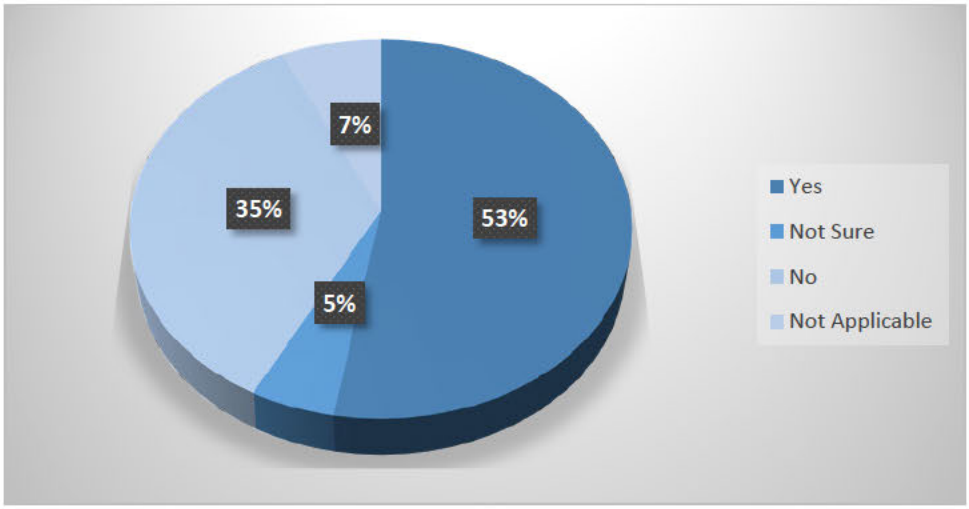

Figure 4.23: Results indicating consultation with a medical professional

4.5 SECTION D: GENERAL ATTITUDES.

The last section of the test instrument looked to capture the general attitudes of the respondents. The first question of the section asked the respondents to state whether they thought that their employer was doing enough in providing a safe working environment. What would they change to improve work environment and if the was a need for continuous trainings?

At total (86.8%) respondents from the sampled population indicated that they strongly agreed, followed by 8% who agreed that employer was providing a safe work environment. 2% strongly disagreed and 3.2% disagreed.

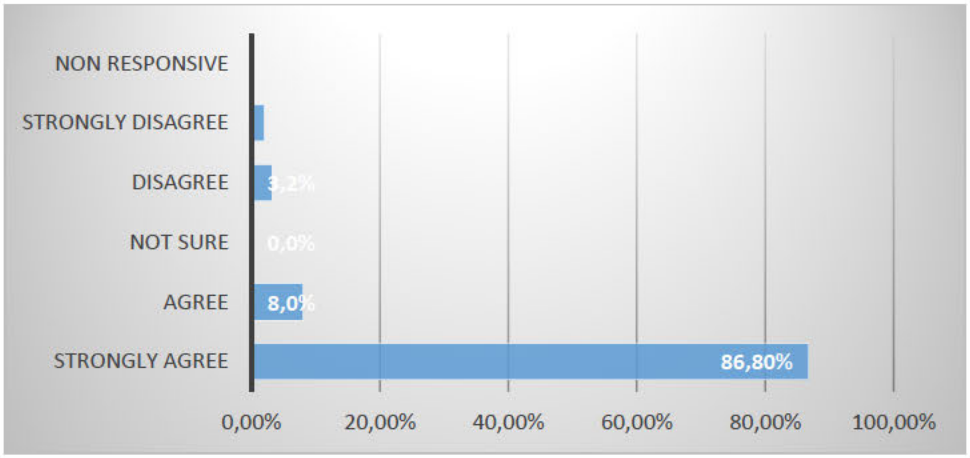

Figure 4.24: Employer doing enough in providing a safe work environment

Employing an open-ended format, [Q32] asked the respondents to give their suggestions on improving safety in the workplace. The responses to the question were analyzed to identify themes of safety improvements. A total of 6 unique themes were identified from the sampled population responses; that is: 2.9% of stop Bad organizational culture, 42.5% of more medical surveillance, 55% Better communication from employer, the provisioning of quality personal protective equipment (PPE) resulted at 50.8%, Truck cleanliness 22.1%, 34.1% of financial incentives: bonus or rewards

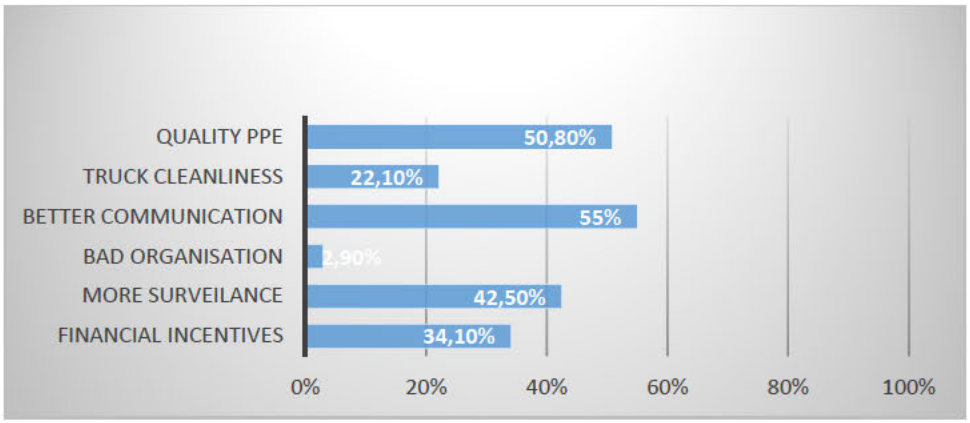

Figure 4.25: Suggestions on improving safety in the workplace

The second to last question of the test instrument, [Q33] asked the respondents if they thought they needed some additional training regarding the hazards associated with handling medical waste. A significant (72.7%) of the respondents indicated that they strongly agree into still needing more training and 14.6% agreed while 1.2% was not sure. 11% disagreed and 0.5% strongly disagreed in having additional trainings.

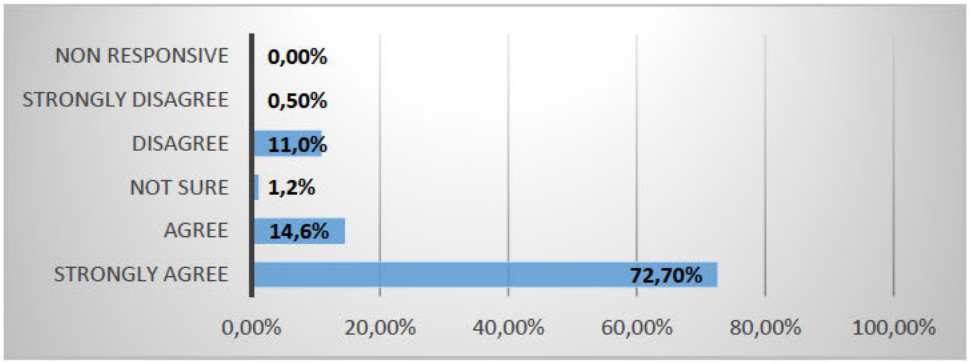

Figure 4.26: Additional training regarding health hazards associated with handling medical waste

Finally, the respondent health care risk waste handlers were asked if there were rewards or compliments on good waste management practice practices offered by the employer. A total of (49.4%) agreed to indicating there were rewards or compliments on good waste management practice. 22.6% strongly agreed while 28% disagree to bonuses and rewards. The rewards help

foster and nurture an organizational culture that seeks to protect the wellness of the individual, the company, and the surrounding communities.

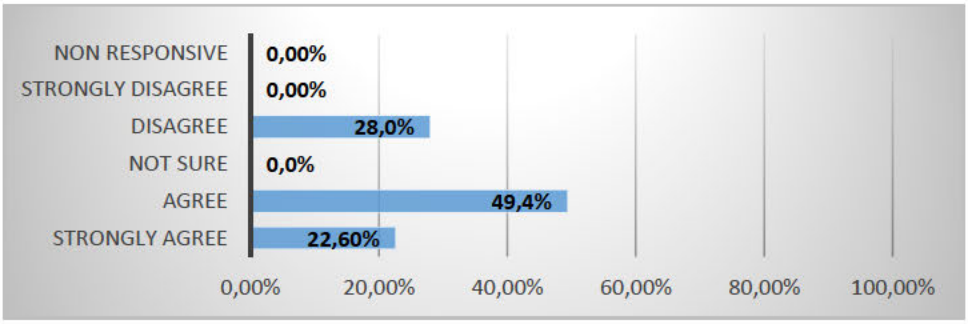

Figure 4.27 : Rewards or compliments on good waste management practice

4.6 CONCLUSION

In this chapter of this report, the summary of the findings is presented. These were obtained using the research test instrument and research procedures outlined in Chapter 3 of this report. Drawing from the literature search presented in Chapter 2, the context and significance of the results of the study are discussed and presented in the next chapter, (Chapter 5) in light of the research objectives stated in Chapter 1.

CHAPTER FIVE: DISCUSSION

5.1 INTRODUCTION

In this chapter, the results presented in the previous chapter will be discussed in light of the research objectives stated in Chapter 1 of this report. The literature presented in Chapter 2 of this report is used to frame and contrast the results with the findings of this study and from recent similar studies. As in the structure of the test instrument, biographic information will precede the analysis of the sub-objectives (Table 5.1).

Table 5.1: Research objectives and associated questions

Research Sub -objectives		Associated questions assessing the said research objective in the test instrument
I.	**Prevalence of communicable diseases**	[Q26] [Q27][Q28] [Q29]
II.	**Occupational risk factors experienced by local medical risk waste handler populous**	[Q20][Q24][Q19][Q25]
III.	**Knowledge of medical risk waste management by the studied local medical risk waste handler populous**	[Q8][Q10][Q11][Q12][Q13][Q14][Q15][Q17]
IV.	**The attitudes towards medical risk waste of the studied local medical risk waste handler populous**	[Q12][Q16][Q21][Q22]
V.	**The Practices / "habits" of the studied medical risk waste handlers**	[Q13]

The discussion of the results was separated by themes, mostly derived from the study objectives as follows:

5.2 DEMOGRAPHIC PROFILE OF THE SAMPLE RISK WASTE HANDLERS

5.2.1 GENDER

The population of interest was sampled as 67 drivers, 85 driver assistants, and 15 machine operators. As per the recommendations of the statistician. Total participants added up to 167. 98% of the participants were males, this is in stark contrast to results obtained by (Olaifa, Govender & Ross, 2018), who were looking to capture the knowledge, attitudes, and practices of healthcare workers about healthcare waste management at a district hospital in KwaZulu. Health care workers in the hospital were classified by the researcher into three distinct populations: professional staff allied; healthcare professionals and non-professional healthcare workers (porters, cleaners, and ward attendants). Using (Olaofa, Govender, & Ross, 2018) classification of the hospital staff, risk waste handlers would fall under the category of non-professional healthcare workers. It was found that most respondents were female, (84%) (Olaifa, Govender & Ross, 2018). A similar female-skewed gender classification was reported by Vumase (2009) within the KwaZulu Natal public hospital administrative and operational staff which showed more females (64%) than males (Vumase, 2009). Keeping the same classification of public hospital staff as discussed earlier in this paragraph, Makhura (2016) studied the knowledge and practices of health care workers on medical waste disposal at a hospital in the Mpumalanga Province in South Africa. Makhura (2016) found that the study population consisted of a significantly larger proportion of female employees as compared to their male counterparts within the same profession, that is (19.1%) male staff as compared to (80.9%) female staff. This study has revealed that there are limited research studies focusing mainly on treatment plants waste handlers.

Moving outside the national borders of South African studies while keeping the study themes ‘ceteris paribus’, Deress et al. (2019) study found that within the 12 clinics, four health centers, and one referral hospital, n=55 (100%) of the medical waste handlers were female. In a tertiary hospital in Botswana, Mugabi, Hattingh and Chima (2018) found that housekeeping staff (which is a classification under which waste handlers fall within their study), comprised (24.3%) of the sample study populace. Further, they found that female respondents were the majority with (71.5%), whereas males were (28.5%) (Mugabi, Hattingh & Chima, 2018).

5.2.2 HIGHEST LEVEL OF EDUCATION COMPLETED

Education levels ranged from primary to tertiary education. N=5 of the sampled participants chose not to indicate the highest formal schooling obtained. This left n=162 valid responses, the majority of the respondents, n=103 making up 61.6% of the sample population, indicated that the highest level of formal education received was a matric certificate, 24.5% had secondary education. The highest level of education completed within the sample population was a Diploma level, of which only 6.5% participants possessed. Olaifa, Govender and Ross (2018) also found similar education stratifications amongst health care workers of a public hospital in the same province as the current study location. Of the n=75 non-professional staff included in the sample population, n=1/241(0.4%) had only a primary education, n=47/241(19.5%) had secondary education.

The majority of waste handlers or housekeeping staff being primary and secondary education holders; do not seem to be a trend only found within the borders of KwaZulu-Natal or South Africa. Deress et al. (2019) found that the majority, n=30 (55.6%) of the sampled housekeeping staff at a tertiary hospital in Debre Markos, Northwest Ethiopia had only received primary schooling or lower, as their highest level of formal schooling. On the other hand, a tertiary public hospital in Botswana Mugabi, Hattingh and Chima (2018) found that none of the n= 171 sampled housekeeping staff had attained more than secondary formal education.

5.2.3 AGE GROUP

The majority of the sampled population was found to be between the ages of 31-40 as 52.6%. This is consistent with the mean age of 38 years, of the respondents found by (Olaifa, Govender & Ross, 2018). Just less than a decade prior, Vumase (2009) found that within his sampled population in KwaZulu-Natal, the mean age of the various sampled administrative and operational health staff was 50+ years old with only 21%, and between 30 and 39 years old 56%. In that study, waste handlers were classified as falling under operational health staff.

At George Masebe hospital, Waterberg District, Limpopo province, South Africa the largest group was between 26-35 years at a frequency distribution of (45,4%) (Malebatja, 2016). Looking geographically further north of the South African border, in Botswana, Mugabi, Hattingh and

Chima (2018) found that the majority of respondents from each category of HCWs were aged between 25 and 34 years (62.5%), housekeeping staff 68.2%, were aged between 25 and 34 years (Mugabi, Hattingh & Chima, 2018).

5.2.4 ETHNICITY

The sample population, n= 167 was found to be comprised of 97% black Africans, with the rest choosing not to indicate their ethnicity. This result is very much expected as the test instrument was translated into vernacular to accommodate the largely black African study population as discussed in chapter 3 of this report. Malebatja (2016) also found a similar ethnicity distribution among health care workers in a public hospital in Limpopo Province, South Africa. Focusing the study on the health workers who handled and disposed of medical waste on daily basis at George Masebe hospital, it was found that the majority of the respondents were black Africans at the frequency distribution of n=140 (99, 3%) of the sampled population (Malebatja, 2016).

5.2.5 EMPLOYMENT STATUS

Of the n=167 responses obtained from the administered questionnaires, n=105 (62.9%) indicating that they were employed on a part time basis. n =54 (32.3 %) indicated that they were contracted workers and only n=8 (4.8%) were participants employed on a full-time basis. This study revealed that the under studied treatment plant did not hire workers on full time basis rather they use long term contracted employers.

The study initially intended to include only those workers that were employed on a full-time basis as waste handlers. However, in the initial phases of the study, it was found that using this exclusion criterion would jeopardize the study, as a significant proportion of the waste handling staff employed by the firm in this study site were part time employed or contracted workers serving long-term contracts or short contracts that were subject to regular renewals.

Excluding these long-term (more than 12 months) workers who are subjected to the same dangerous occupational hazards for a prolonged period would have skewed the results of the

investigation in a direction that renders the findings impotent in showing the full picture of the investigated phenomena. The significance of the contracted workers is also reflected in the next question of the questionnaire that asked the respondents to indicate the duration of employment.

5.2.6 EMPLOYMENT SERVICE

It was found in [Q6) that most of the sampled population 59.8% had been working for 1 to 5 years for the firm as a risk waste handler. 1.1% had 20 years and more of service in the company. 3.6% had worked for 16 to 20 year while 11 to 15 years of work experience was 5.3% and lastly 29.9% of participants who had worked for 6 to 10 year. Looking at these results it is proven that the company does not keep workers for a long period of time. This could be the fact that they rely on contract employment and they do not renew contracts once certain years are reached, also this could be a way of preventing employees from being exposed to health care risk waste hazards for over a long period of years or just to avoid legal implications stipulated under the Compensation for Occupational Injuries and diseases Act (COIDA).

Perhaps the health care sector, in particular, the waste management portion, is not a very rewarding or fulfilling sector to work in. This claim by the researcher is further substantiated by Vumase (2009). An evaluation of the operational and administrative procedures for health care waste management where n=27 public district hospitals scattered equally across the nine provinces of South Africa, found that within their sampled population of 10 employees involved in HCW management, only (30%) had worked in the public hospitals for a period of one to five years (Vumase, 2009).

In a descriptive cross-sectional study conducted at a tertiary government healthcare facility in Gaborone, Botswana, n=198 housekeeping personnel were included in the study population of 703 respondents. In the results of the analysis, it was found that, 93.6% (592/632) had worked at the hospital for less than 10 years, whereas the remaining 6.4% (40/632) reported having worked at the hospital for more than 11 years (Mugabi, Hattingh & Chima, 2018).

5.2.7 SHIFTS PER WEEK

Looking at the average shift frequency that each waste handler works. 56.8% of the respondents worked 3 to 5 days and this was the highest. 17.3% worked the whole week and only 1.2% worked 1 to 2 days leaving 5 to 6 days as the second highest number of days worked, by 24.5%. The study did not address was the duration of the shifts. A high average shift rate is a key indicator of a possible strenuous occupational requirement.

5.3 AWARENESS AND KNOWLEDGE CONCERNING WASTE MANAGEMENT

[Q8] Started the inquiry into health care risk waste handlers' awareness and understanding of waste management in a series of related questions, [Q8] [Q10] [Q11] [Q12].

5.3.1 UNDERSTANDING OF WASTE MANAGEMENT

The results of [Q8] (an open-ended question) show that the sampled population of medical waste handlers' understanding of waste management practices is generally good. The results show that within the sampled population of health care risk waste handlers, (79%) of the n=167, respondents showed excellent comprehension of waste management practices. 57% had partial understanding while 33% were not so sure, 5% of the participants did not respond as might be the result indicating they did not know anything with regards to waste management.

Makhura conducted a study back in 2016, which aimed to determine the knowledge and practices of health care workers on medical waste disposal in Mapulaneng Hospital at the Ehlanzeni District in South Africa". It is to be noted however that the composition of the study population of Makhura (2016) was different from this present study's sample population, in terms of the demographic profile, however his results showed 50% of health care workers who had no knowledge of medical waste disposal.

5.3.2 ROLES

A total of n=67 Drivers, n=85 driver assistance/general workers, and n = 15 machine operators chose to indicate their job titles from our sample population of n=167 respondents. This represented 40.1%, 50.8%, and 8.9% of the total sampled participants. Being guided by the sample size issued by the statistician, the researcher was careful with the volunteers that whomever that accepted to participate number were monitored closely that once the target of a certain group was reached, the researcher would not accept further participants of that same group.

5.3.3 WASTE MANAGEMENT TRAINING RECEIVED

A total of (91.6%) respondents, indicated that they had received some form of training regarding waste management. This result is welcoming to find as an assessment of health care waste management compliance in the Northern Cape Department of Health of South Africa, (Motlatla, 2015) found that of the 11 hospitals that participated in the study, only three (27.3%) provided health care waste management training for their staff (Motlatla, 2015). Poor or inadequate medical waste management practices by the current study population, at the source of the waste greatly increase the chances of accidental exposure to pathogens through incidents described in Chapter 2 of this report.

5.3.4 TRAINING CLEAR AND BRIEF

Furthermore, (88.6%) of the respondents indicated that they believed that waste management training was clear and brief to them. The response to [Q10] together with the response to this present question is good to find. If the results obtained by Olaifa, Govender and Ross (2018) are to be generalized as representing the situation in the public hospitals of KwaZulu-Natal province, then there exists a greater need to ensure that waste handlers services of these hospitals fully comprehend the risks and hazards of the job. This is because Olaifa, Govender and Ross (2018) found that within their study sample, only 51.2% of “other professionals” and 52.8% of nurses reported sorting HCW when depositing it into collection bins. Unsafe HCW disposal practices by hospital staff located within the same province as the current study location endanger and place a greater need on waste handlers to be adequately trained in the proper handling of HCW to protect

themselves and the communities that they interact with daily inside and outside the occupational setting.

5.3.5 BELIEVED THAT HCRW WAS HAZARDOUS

And lastly, in this section of the test instrument, it was found that in total of the respondents who both strongly agreed and agreed to health care risk waste being hazardous was 152 (94.%). Health care risk waste handlers in the treatment facility are aware that health care risk waste pose a health risk therefore these results give an implication that one would be cautious when handling health care risk waste.

Studies conducted within the health care waste sector have largely looked at the combination of employees employed directly by a local primary health care facility that directly get to handle or generate medical risk waste while conducting their occupational duties, namely, in-house hospital housekeeping staff, nurses and doctors employed at a local public district hospital (Olaifa , Govender & Ross, 2018; Makhura, 2016; Malebatja, 2016; Vumase, 2009; Mugabi , Hattingh & Chima, 2018; Al-Emad, 2011).

This makes this current study population more at risk of contracting and spreading communicable diseases as they serve several different district hospitals per day and per shift than in-house hospital housekeeping staff, nurses, doctors, employed at a local public district hospital as discussed, a few paragraphs earlier in section. Further, the health care facilities that they service, (within a given shift) have varying organizational cultures that may have favorable or adverse consequences, on the adherence to good health care waste management (HCWM) practices such as waste segregation and Duty to Care. This increases the risk of accidental exposure to pathogens by unsuspecting contracted waste handlers who come to collect the risk waste from a given primary care facility.

5.4 AWARENESS AND KNOWLEDGE IN RELATION TO HANDLING HEALTHCARE RISK WASTE (HCRW)

The lack of training of medical risk waste handlers in the procedures of collecting and disposing of HCRW has been attributed to a higher incident rate of exposure to medical risk waste (Al-Emad, 2011). In this study, it is welcoming to find, [Q13] that a significantly large majority of the sampled population indicated to have been trained on HCRW by 94%. 5.4% also agreed and only 0.6% of the received data were not sure.

Adequate periodic training is a key factor for safe and effective management of health care risk waste (Deress et al., 2019). Hence, it is pleasing to find that of the (95.2%) and 4% felt that the training was clear and brief to them. 0.8% indicated that they were not sure that the training provided to them was adequate.

Open communication and transparency between the employer and employee are important to ensure the safety of the waste handler. Waste handling is very hazardous and one needs to be constantly cognisant of the risks involved while executing their occupational duties. It is welcoming to find that within the sampled population (96.4%) of the respondents indicated, that they had received formal communication from the employer about the health hazards associated with health care waste. This result indicates a generally good culture of communication of the risks involved in handling health care risk waste between employer and employee within the investigated firm.

Logically building on the previous question; [Q16] looked to assess the awareness of sampled population with regards to the inherent risks involved in handling medical risk waste. Once again, it is to be emphasized that the training of staff increases the staff's awareness of the hazardous environment in which they operate. The results showed that 95.8% of the respondents indicated that they were aware that handling medical waste could expose them to some communicable diseases. This is important considering that in the same catchment area as the one serviced by our study population, Olaifa, Govender and Ross (2018) concluded that most participants in their study (public district hospital staff), were unaware of the hazards associated the improper disposal of medical waste.

A healthy and proactive organizational culture helps mitigate the realities of the hazardous environment that waste handlers operate under. It is also important that employees are aware that any protective control measures in place are solemnly there for their safety as well as the safety of those around them including loved ones at home. [Q17] sought to determine the awareness of the sample population with regards to protective control measures in place by the employer. A total of (96.4%) of the sample respondents indicated that they were aware of some form of protective control measures in place in the workplace. Leaving only 3.6% who disagreed to protective and control measure being in place.

Several types of control measures can be adopted by a firm to help mitigate the risk of an accident, incident or injury when handling health care risk waste. The provisioning of adequate personal protective clothing (PPE) by the employer is one such control measure that should be in place as legislated in South African Labor law under the Occupational Health and Safety Act 85 of 1993. In light of this, respondents were asked to indicate the personal protective equipment that they had been provisioned with [Q18]. The majority by (94%) of the sampled respondents indicated that they had received gloves, 97% safety shoes, 96% received overall suits and 90% for face masks, while just 60% of the respondents indicated that had been provisioned with goggles and 33% received face shields. These results indicate a generally good culture of PPE provisioning by the employer.

Furthermore, in [Q19], (92.8%) of the valid respondents indicated that they strongly believed that the in-situ control measures were effective. Adding 2% of responses who also agreed to such. 5.2% of the participants disagreed in the effectiveness of the PPE, stating the poor quality especially on the gloves.

Again question 20 sought to find if PPE was provided by the employer to the HCRW handlers, 86.2% strongly agreed with 5.5% who agreed and only 8.3% did not agree to this question. It is clear though that a majority of employees were provided with PPE.

However, the success of PPE depends in part on whether or not workers use it. [Q21] asked the respondents whether or not they used personal protective clothing all the time when handling waste? Of the respondents, (95.2%) indicated that they used personal protective equipment all the

time when handling waste. (4.8%) respondents chose not to indicate their responses (or spoilt their responses by indicating more than one answer).

Because the consistent use of PPE is so vital to ensure the safety of the individual HCRW handler as well the immediate community around him, the respondents' awareness and perceptions with regards to safely handling medical risk waste were again assessed in [Q22]. Here, respondents were asked to indicate whether they thought personal protective equipment (PPE) should be used when dealing with medical waste? A total of (95.8%) responses were obtained from the sampled population strongly agreed. Of the responses, (3.6%) respondents indicated that they did not think that it is necessary to use personal protective equipment when dealing with HCRW waste. The result is consistent with that of the question [Q21], which is expected., that is, only if the respondents answered the two questions honestly. This is because the two questions, [Q21] and [Q22] seek to determine the practice of the same habit; that is the use of PPE while executing their daily duties.

Organizational culture refers to the set of explicit and implicit beliefs and values that exists in an organization and to the beliefs of the staff of the said organization. These beliefs and values will in turn influence the staff's general attitude, behavior, and habits (Tsai, 2011). [Q23] looked to build a clearer picture of the organizational culture of the studied sample population. It asked whether or not the respondents believed that protective clothing is effective. Of the responses, received (88.4%) indicated that they strongly believed with 0.8% who also agreed that personal protective clothing was effective. The results of [Q21], [Q22], and [Q23] point toward a healthy organizational culture towards the hazards which are inherent in medical risk waste handling as discussed in Chapter 2 of this report. 4.8% were not sure and 6% disagree to PPE effectiveness on their daily duties.

In Chapter 2 of this report, the hazards associated with handling medical risk waste were extensively discussed. Of these hazards, communicable diseases, specifically those belonging to the hepatitis virus family were identified as posing a serious threat to the wellbeing of medical risk of HCRW handlers. In light of the literature review conducted as well as the research objectives stated in the first chapter of this report; the respondents in this study were asked whether they had ever received a hepatitis vaccination, [Q24]. In total, (82.2%) respondents indicated their

vaccination history. (2%) were not sure, and (11.2%) said that they had never received the vaccination before including the 4.6% who did not respond.

Furthermore, 54.4% indicated to have been vaccinated for hepatitis within a year and 22.7% were vaccinated between 2 to 5 Years. 4.8% had their last vaccine more than 5 years ago while 10.3% had never been vaccinated and the 7.8% just did not know or remember.

One of the main research objectives as shown in Table 5.1 was to determine the prevalence of communicable diseases among our study sample and hence help draw a picture of the condition of our study population at large. The responses to [Q26] and [Q27] looked to provide some indication of the extent that which healthy individuals contract communicable once they start working as HCRW handlers. Although the nature of communicable diseases is that they can be contracted outside the occupational setting, as discussed in chapter 2; in [Q26] it was found that close to half of the study respondents (49.1%) have suffered from an illness since working as a HCRW handler. On the other hand, 49% indicated to have never suffered such illness during their time of employment. 1.9% indicated as not sure.

The anonymity of the respondents was always stressed to the respondents and maintained throughout the study as discussed in Chapter 3 of this report. Therefore, in [Q27], respondents were asked in follow-up to the response to [Q26] to indicate the communicable disease with which they were diagnosed since becoming employed as health care risk waste handlers. The results showed that (42.2%) of the sample population indicated that they had been diagnosed with a cough. A cough as discussed in chapter 2, can result from several reasons and is quite common within society. It is therefore not surprising that within the list of communicable diseases respondents could select as having experienced since the commencement of their occupational duties. Skin rash received (10.8%) of respondents had suffered, and (7.2%) indicated that they had suffered from hepatitis No respondent, indicated that they had contracted HIV since working as a HCRW handler. Only n=4 (2.4%) respondents indicated that they had been treated with tuberculosis since working as a HCRW handler, however there is a high percentage indicated as other sickness at 37.4%, participants felt not to disclose their sickness, further studies can be conducted to look deep in these sicknesses.

The second research objective as presented in the first chapter of this report and again in this present chapter in Table 5.1 sought to better understand the occupational risk factors experienced by the local health care risk waste handler populous. The various types of hazards and injuries that may result from medical waste handling activities were presented in Chapter 2. Within the sample population, it was found that half of the respondents (50.6%) had not experienced medical waste-related injuries since the commencement of their occupational duties, while only 44% indicated to have suffered and injury or incident at work. 5.4% were respondents not sure. Similar to the studies done by Bazie (2020); Berhan et al. (2021); Doggalli (2014); International Committee of the Red Cross (2011), it was found in this study that the majority of the injuries experienced by the current sample population is needle stick injuries, with n=65 (39.2%) indicating that they had experienced it. The overall attitude towards the hazards associated with waste handling activities can be reflected in the practices of workers should they experience an occupational-related injury. The practice of seeking medical attention, such that remedial action can be swiftly taken is very important and the failure to do so reflects a negative or careless attitude towards the inherent dangers that the worker faces.

Types of injuries analyzed and needle stick was the highest by 54% followed by 33.7% from in contact with waste fluids. Blood splashes were indicated aas10.3%. Only 2% of the responses indicated that question was not applicable to them. A total of 52.9% which was rounded off to 53% indicated to have sought for medical attention after the experience of a sickness or an injury. 35.3% did not visit any doctor or nurse, they depended on the body to heal itself. 5% were not sure or did not remember and the 7.1% indicated that the question was not applicable to them.

5.5 GENERAL ATTITUDES

The last section of the instrument looked to capture the general attitudes of participants towards their occupation. It started by asking the respondents whether they thought that their employer was doing enough in providing a safe work environment, most of the sampled population (86.8%) strongly agreed that their employer was doing enough to ensure that the working environment is safe. However, to make better make recommendations employer could provide better quality of PPE especially gloves.

5.5.1 EMPLOYERS EFFORT TO PROVISION OF SAFE ENVIRONMENT

Both the strongly agreed and agreed responses totaled to 94.8% however there were participants who strongly disagreed by 2% and those that just disagreed to the employer's provision of safe working environment by 3.2%

5.5.2 SUGGESTIONS OF IMPROVING SAFETY AT WORK

The follow-up question, [Q32] was open-ended so that waste handlers could more freely express or identify the occupational risk factors in handling health care risk waste in a treatment plant in a low-income/ developing country which might not be immediately apparent to the researcher or observer. A total of 6 unique themes were identified from the sampled population responses; that is: bad organizational culture, more medical surveillance, better communication from employers, the provisioning of quality personal protective equipment (PPE), truck cleanliness, and financial incentives.

It is welcoming to find that this open-ended question received a very large overall response rate. The theme that was the most frequently occurring within the suggestions made by the respondents on how safety could be improved in the workplace was better communication by the firm to the workers 55% HCRW handlers felt that changes are not transparent and well communicated therefore they would like more meeting and tool talks and refresher in-service trainings.

Followed by the provisioning of quality personal protective equipment (PPE) by 50.8%. Of the respondents who indicated the need for quality personal protective equipment, a significant subset expressed brazenly that "stronger" gloves were desperately required to improve the safety of their workplace. It is unfortunate that in this study the respondents were not explicitly asked to indicate the type, the average quantity, and the frequency of the provisioning of PPE. It is recommended that future studies factor in and look to capture, these sample features as they help make the picture clearer as to what is happening and how the study population can be helped for example, through legislation of minimum quality standards of the type and provisioning frequency of PPE.

The third most mentioned suggestion that was given by the HCRW handlers on improving their workplace was a quest of more medical Surveillances which was 42.5% the company might not be liable for the medical surveillance as employers are hired through agent on contract basis however the Agent in discussion should be ensuring that medical surveillance is done for the employees. This is unfortunate because a gap is already created by the employment system and employers are not in a protected space, but the level of knowledge by the respondents was fascinating and I observed that their suggestions were of reason.

Financial incentives for example bonus and rewards 34.1%. HCRW handlers expressed the need for a better rewards programs linked to their performance or some other performance indicators. 22.1% mentioned improvement of the truck cleanliness as they mostly would find trucks unwashed on the start of the new shift. And lastly 2.9% felt that the company can improve on the organizational culture. Organizational culture that seeks to improve leadership, workers value and innovating workers.

5.5.3 ADDITIONAL TRAINING REQUIRED

The second to last question of the test instrument, [Q33] asked the respondents if they thought they needed some additional training regarding the hazards associated with handling medical waste. A total of (72.7%) strongly agreed while 14.6% just agreed. Only 1.2% were not sure while 11% disagreed and 0.5% strongly disagreed.

5.5.4 INCENTIVES PROVISION

Finally, the respondent health care risk waste handlers were asked [Q34] if there were rewards or compliments on good waste management practices practiced offered by the employer. A significant response of 0% strongly disagreed followed by a low response of 28% of who disagreed, meaning the firm does provide rewards and bonuses hence72% were in both agreement and strongly agreed, however waste handlers might not be satisfied with the amounts.

5.6 CONCLUSION

In this chapter, the results were discussed in light of the research objectives stated in Chapter 1 of this report. The literature presented in Chapter 2 of this report was used to frame and contrast the results with the findings of this study and from recent similar studies. The next chapter presents the conclusions and recommendations of the study.

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CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION

This chapter presents the study limitations and the methods used to attenuate them. This is then followed by a presentation on the conclusions and recommendations which are framed by the research aim and objectives of the study. The conclusions further map out future development projects that can be undertaken to address the identified shortfalls that were found.

6.2 STUDY LIMITATIONS AND METHODS USED TO ATTENUATE THEM

"Study limitations represent weaknesses within a research design that may influence outcomes and conclusions of the research" (Ross & Bibler Zaidi, 2019) This subsection reports on the study limitations and describes the potential limitations, explains the implication of the limitation, and describes the steps taken to mitigate the limitation by the researcher.

6.2.1 EPIDEMIOLOGICAL INVESTIGATIONS LIMITATIONS AND METHODS USED TO ATTENUATE THEM.

A key feature of epidemiological investigations such as this one is the fact that the researcher had to accept information of interest as they have been or are being recorded which results in a variety of problems, i.e. the results are limited by the respondent's comprehension and honesty when answering the questionnaire, thereby limiting the inferences that can be derived from the study (Lilienfeld, 1983).Evidence of this can be seen in the response to Question 16 which sought to know if participants believe that handling HCRW could expose them to communicable diseases , response was very high as seen to be at 95.8% however when reading results of the actual people who have experience the diseases it just 49%. Possible reasons for this could be either be poor literacy levels of the sample population as evidence by the low education level of target population,

referencing from question 2 of the data collection tool majority had matric as their highest level of education. or simple dishonesty are suspected as the lead causes.

To mitigate literacy issues which were initially suspected as a characteristic of the target research population, the research questionnaire was first piloted and revised as discussed in Chapter 3. Secondly the research questionnaire was translated into the local vernacular language such that it was both available in English and isiZulu (the vernacular). Furthermore, the researcher offered to help respondents with any comprehension issues during the administering of the questionnaire. However, no respondents took the latter offer maybe due to peer pressure from colleagues

To try improve the levels of honesty of the respondents in answering the questionnaire, the researcher continuously stressed the fact that respondents would not be identified in the research or in the findings in any manner, i.e. their confidentiality and anonymity was stressed throughout the recruitment and well as in the administering phases of the research as outlined in Chapter 3 of this report, however participants felt its best they give as little information as possible to not jeopardize their position in the firm

6.3 CONCLUSIONS

The proper study of man is man." (Lilienfeld, 1983) Notwithstanding the limitations presented in the former section, this study provides useful information about the research objectives discussed in Chapter 1. In this present chapter, these research objectives will be used to frame the conclusions that were inferred using the results of the investigation.

6.3.1 THE OCCUPATIONAL RISK FACTORS EXPERIENCED BY THE SAMPLED POPULATION.

Needle prick, and contact with waste medical fluids were two of the most experienced incidences. Needle stick rated 54% followed by contacts with waste fluids at 33.7%.

6.3.2 THE PREVALENCE OF COMMUNICABLE DISEASES EXPERIENCED BY THE SAMPLED POPULATION.

Results show that a large proportion of the sample population 42.2% had indicated that they had suffered from cough since the commencement of their occupational duties. A cough has one of the broadest bases of source root causes and hence the researcher concludes that from the data gathered in this study about the prevalence of communicable disease, this study concludes that the picture is not clear

6.3.3 THE KNOWLEDGE OF HCRW RISK WASTE MANAGEMENT PRACTICES BY THE SAMPLED POPULATION

The majority of the sample populous was found to be very aware of the hazards inherent in their occupation. Consistently in the response rate as well as the overall response to [Q12] [Q16] [Q21] [Q22], looking to gauge the respondent's awareness or to display knowledge of the said hazards is evidence to the claim by the researcher. Furthermore, [Q8] [Q10] [Q11] [Q12] [Q13] [Q14] [Q15] [Q17], on medical waste management practices, supports this claim.

6.3.4 THE ATTITUDES OF HCRW HANDLERS TOWARDS THE USE OF PPE

It is concluded that a third of the studied sample populous namely, one in every three of the sample risk waste handlers, felt that they were undervalued and expressed the need for better financial performance-based rewards to be offered by the employer. When employees feel undervalued, often employee retention becomes a problem. The average duration of employment of the sample population further supports this claim by the researcher. Poor employee retention places a greater and extra need to frequently train new onboarding staff and places current staff at risk as new employees become acquainted with practicing the correct habits in a disciplined way daily, so that they may protect themselves and those around them for example, seasoned colleagues.

6.4 RECOMMENDATIONS

6.4.1 RECOMMENDATIONS ON THE OCCUPATIONAL RISK FACTORS EXPERIENCED BY THE SAMPLED POPULATION

Needle prick, and contact with waste medical fluids were two of the most commonly experienced incidences, for negative health impacts to be minimized through the use of correct gloves for example, long thick rubber gloves. PPE-based studies in particular focus on capturing the use of gloves to get a clearer definite picture and hence provide minimum standards for regulators to implement is recommended by the researcher. Furthermore, given the rates of puncture and incidences relating to contact with medical waste fluids, it may be warranted to require mandatory vaccination against vaccine preventable diseases like HBV and HCV of all employees by employers of those who on board the risk waste handling occupation to ensure the safety of staff and those around them.

Refresher trainings on health care risk waste management and continuous supervision are also recommended to promote proper HCRW practices especially given the high job turnover rate which was suggested by the results of the sampled population.

Lastly, future studies look into developing a sustainable model that seeks to enrich the work experience, by developing key performance indicators for medical risk waste handlers that foster a culture of safety by rewarding continuous safe practices whilst conducting occupational duties. This could promote a healthy job turnover and the firm can have more experienced workers per shift which could result in fewer incidences.

6.4.2 RECOMMENDATIONS ON THE PREVALENCE OF COMMUNICABLE DISEASES EXPERIENCED BY THE SAMPLED POPULATION

A two-part recommendation is suggested to this end. The first is that mandatory monitoring of employee wellness through yearly screening is recommended.

Secondly, at present there have been very limited studies of the seroprevalence of vaccine preventable diseases in health care risk waste handlers. The high job turnover as suggested by the average number of years worked by each employee seeks to suggest an unfavorable working environment at the very least, if not for health reasons that workers are leaving for a secure job. Without such studies it is difficult to proceed to give clear guidance to workers and employer regarding vaccinations.

However, given the rates of incidences reported by the sampled population which could lead to infection, a study measuring the seroprevalence of vaccine preventable diseases in health care risk waste handlers and a comparison of these rates to the general community would provide evidence showing the actual risk of infection. This evidence would aid in the development of vaccination recommendations in the health care risk waste management industry.

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APPENDICES

APPENDIX A: LETTER OF INFORMATION (ENGLISH)

LETTER OF INFORMATION

Title of the Research Study: An investigation into the occupational risk factors and prevalence of communicable diseases amongst health care risk waste handlers in treatment plants at eThekwini District in KwaZulu Natal (KZN).

Principal Investigator/s/researcher:

Siphephile Myeni, B-Tech in Environmental Health

Co-Investigator/s/supervisor/s: Dr. Shanaz Ghuman (PhD, Master's in Public Health) and Monica Dalasile (Master's in Environmental Health)

Brief Introduction and Purpose of the Study:
Many waste handlers are affected by handling health care risk waste and end up with communicable diseases. Majority of these individuals are unaware of the health hazards that are associated with handling health care risk waste. The purpose of this study is to determine the prevalence of communicable diseases and risk factors from handling health care risk waste. The researcher wants to determine the level of awareness and perceptions of employees regarding health care risk waste handling and if protective gears are used.

Greeting: Good day to All, I trust that you are all well.

Introduce yourself to the participant: I am Siphephile Myeni a student at DUT doing research for my master's degree in Environmental Health.

Invitation to the potential participant I would like to invite you to participate in the research mentioned above. This research will help us enlighten the way we handle health care risk waste and at the end we

would be able to handle health care risk waste in manner that will not have impact on our health as health care risk waste handlers.

What is Research: Research is a systematic search or enquiry for generalized new knowledge. It is where the researcher gathers information on a selected study area, that information is than analyses and the researcher can draw conclusions from the results.

You can ask any question you might have and ask for clarity where you feel you did not totally understand, hence it is important you fully understand the study and remember you are not forced to take part in the study. You are entitled to discuss the study with your family and friends. You are under no obligation to commit at this stage. Therefore, at this stage a copy of the Letter of Information document will be given to you as a potential participant to take home and think about it.

Outline of the Procedures: The research aims to investigate the prevalence of communicable disease and occupational risk factors amongst health care risk waste handlers in a treatment plant. Objectives of the study are to determine the prevalence of communicable disease amongst health care risk waste handlers in a treatment plant and to identify the occupational risk factors in handling health care risk waste in a treatment plant. This study will enable the researcher as well as treatment plants of ways to improve health care risk waste handling and that way also improving health on health care risk waste handlers.

You must volunteer to take part in the study and must have been working for the company for at least a year; you must either be a driver, driver's assistant or a machine operator. Management and office staff will be excluded from the study.

Should you willingly want to participate you must sign a consent form. There will be a questionnaire that you will answer in a truthful manner. This questionnaire is the only tool the researcher will be using to obtain raw data. The question will look in your demographics' details, your knowledge in handling waste and awareness of health care risk waste and lastly your attitude towards handling Health care risk waste. You will have to honestly fill in the questionnaire. Questionnaire will be of both open and close ended questions, in two languages which are isiZulu and English. You will choose one preferred language to respond in. If you cannot write the researcher will read to you from the questionnaire and record your responses on a recorder.

The study will sample 167 employees and the data collection is proposed to take one month, all participants will be scheduled according to their shifts, targeting 10 participants a day. Administering of

questionnaires will be done individually in a private room. Questionnaires will be coded; no names will be written on them. All data collection will take place at the treatment plant unless there are strong circumstances. All data will be transported in a secured box, securely stored in a cupboard that will be kept locked for five years, only accessible by the researcher and supervisor, all electronic information will be password locked accessible to only the researcher and supervisor. These will be discarded after 5 years through shredding of hard copies and deleting off the soft copy.

Risks or Discomforts to the Participant: No risks will be presented to participants; data collection method is only a questionnaire.

Explain to the participant the reasons he/she may be withdraw from the Study: Your participation in this research is completely voluntary. You can drop out at any given time and it will have no effect on you or your job. There will be no penalties when you withdraw from the study. Should you wish to terminate participation, please let the researcher know at any given time?

Benefits: This study will give both the employer and employees more knowledge and better understanding on the importance of wearing personal protective clothing as well as improving waste handling methods in the plant.

Remuneration: There will be no form of remuneration. Participation is voluntary.

Costs of the Study: You will not under any circumstance pay for the study. They will be no cost or money needed from you as part of the study.

Confidentiality: Your name will not appear anywhere in the research, the data collected will be named in codes, meetings and interviews will be in private rooms away from other workers, no one will know you were the participant. All the information collected will be kept confidential in lock and key cabinets accessible only by the researcher and supervisors. After 5 years of keeping the raw data it will be destroyed through shredding and electronic data will be deleted. In addition, a statement of confidentiality will be signed by the researcher.

Results: Once the study is complete, the researcher will come back to the treatment plant and host a seminar for the treatment plant, where results will be disseminated.

Research-related Injury: Research presents no injury to participants.

Storage of all electronic and hard copies including tape recordings: All the information collected will be kept confidential in lock and key cabinets in the office only accessible by the researcher and supervisors. All recordings will be deleted. All electronic information will be password locked accessible to only the researcher and supervisor. These will be discarded after 5 years through shredding of hard copies and deleting off the soft copy.

Persons to contact in the Event of Any Problems or Queries: (Dr. Shanaz Ghuman, contact number: 031 373 2807). Please contact the researcher (081 505 9878), my supervisor (083 588 3245) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support Prof K Motaung on 031 373 2577 or researchdirector@dut.ac.za.

APPENDIX B: CONSENT LETTER (ENGLISH)

CONSENT

Full Title of the Study: An investigation into the occupational risk factors and prevalence of communicable diseases amongst health care risk waste handlers in treatment plants at eThekwini District in KwaZulu Natal (KZN).

Names of Researcher/s: Siphephile Myeni

Statement of Agreement to Participate in the Research Study

I hereby confirm that I have been informed by the researcher, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance

Number: **108/20 ___**,

- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerized system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature / Right Thumbprint**

I, **S. Myeni** (name of researcher) herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

SIPHEPHILE MYENI		
Full Name of Researcher	**Date**	**Signature**
Full Name of Witness (If applicable)	**Date**	**Signature**
Full Name of Legal Guardian (If applicable) Isingenis	**Date**	**Signature**

APPENDIX C: LETTER OF INFORMATION (ZULU)

INCWADI YOLWAZI

ISIHLOKO SESIFUNDO SEZOCWANINGO: Ucwaningo lezifo nemithelela yezifo kubantu abaqoqa udoti onobungozi ezindaweni zokuhlanza.

INHLOKO YOMPHENYI / UMCWANINGI: Siphephile Myeni (B- Tech: Environmental Health)

ABAMBISENE NAYE/ UMPHATHI / NOMA UMQONDISI: Dokotela Shanaz Ghuman (oneziqu zPhD: Kanye ne master's in public health) Kanye no Nksz Monica Dalasile oneziqu ze Masters kwi - Environmental Health.

ISINGENISO NENQIKITHI YOCWANINGO:

Baningi abasenza ngodoti onobungozi osuka ezibhedlela abagcina sebezithola begula. Abaningi babo abaqhondi futhi abazi lokugula bakuthola kanjani yize noma abanye benazo izinsolo zokuguliswa udoti onobungozi kepha akunasiqiniseko. Ngakho ke lolucwaningo lihlose ukuthola izinqinamba ababhekene nazo laba basebenzi futhi nokuthi lezinqinamba zingaphathisana ngaziphi izinhlobo zezifo, ucwaningo luzobhekisise ukuthi ngabe izimvikela zinsiza ngampela ziyamuvikela yini umsebenzi ekutheni angaguli.

ISIBINGELELO: ngiyabingelela ngokukhulu ukuzithoba, ngiyathemba usagcinekile.

ZAZISE KUBA BAMBIQHAZA: Mina ngingu Siphephile wakwa Myeni, ngiwumfundi wase DUT ngenza iziqhu zami ze master's kwi Environmental health.

ISIMEMO KWABAFISA UKUBAMBA IQHAZA: ngokukhulu ukuzithoba kini ngizocela othandayo futhi onesifiso sokuzibandakanye kuloligcwaningo angelele. Ucwaningo lolu luzosivula amehlo ngezindlela zokuphathwa kuka doti onobungozi Kanye nezindlela zokuzivikela zingabantu amasebenza ngalo doti imihla namalanga.

YINI I RESEARCH: iyindlela yocwaningo nokuthola ulwazi olusha. Umgcwaningi uthola ulwazi kulendima asuke ayikhethile bese akhona ukwenza isiphetho ngokubuka imiphumela asuke eyitholile.

Ungabuza nanoma imuphi umubuzo okufikelayo futhi ucele nokucaciselwa lapho ungezwanga khona kahle. Cela wazi ukuthi awuphooqiwe futhi ungayeka nanoma inini lapho isufisa. Ungayithatha lencadi yolwazi uyidinginde nomdeni Kanye nabangani. Lapho uma uthatha isinqhumo sokuzibandakanya sizocela usayine incwadi yesivumelwano.

UHLELO LOGCWANINGO: Ucwaningo lolu luzophenya ngezifo ezithelelanayo Kanye nemibandela yomusebenzi okungenzeka yehlise izinga lempilo kubaphathi bakadoti obunobungozi. Imvumo ephuma kubaphathi benkampani, imvumo ephuma ku komiti lama Ethics ekolishi. Ukubamba iqaza akuphoqiwe, incwadi echazayo ngoncwaningo ikhona futhi umbambi qaza uzochazelwa ngayo ngolimi lwakhe. Umbambi qhaza uzosayina incwadi yesivumelwano kodwa uvumelekile nanoma inini ukuthi engayekela ukubamba iqaza. Kunohla lwemibuzo umbambiqaza okumele alugcwalise ngokweqiniso futhi ngolimi aluthandayo Phakathi kwesiZulu nesiNgisi, kulaba abangakhoni ukubhala umcwaningi uzobabuza ngomlomo bese abarekhode izimpendulo zabo.
Kumele uzikhethele wena ngokuthanda ukuzibandakanye nalolucwaningo. Kumele kube ukuthi ususebenzele lenkampani isikhathi esingangonyaka noma ngaphezulu okubalulekile kumele ube umqubi we truck ka doti, umsizi kamqhubi noma u ophalayitha imishini ka doti. Abaphathi kanye nomabhalane abavumelekile ukubamba iqhaza.

Ucwaningo luzothatha indawo KwaZulu Natal kwikampani kadoti e westmead. Angeke bavumelwe ukubamba iqhaza abasebenzi abangenawo unyaka besenza emkampanini Kanye nalaba abaqashwe ngokungagcwele. Ucwaningo lolu luzo thatha inyanga eyodwa ukuthola I data.

Kuzokwenziwa abayishumi ngelanga ngokubheka izinsuku abeza ngazo emsebenzini.

Ababambi qhaza bazo phendula imibuzo emayelana nabo, ulwazi lokuphatha udoti onobungozi Kanye nokuziphatha kwabo. Imibuzo eminye uphendula yebo noma cha kanti eminye uyanama uchaze kabanzi. Kumele uphendule ngeqiniso ngasosonke isikhathi. Uzozi khethela wena ukuphendula ngesiLungu noma ngesiZulu. Uma ungakwazi ukukufunda nokubhala umcwaningi uzokufundela imibuzo ngolimi oluthandayo beso aziqhopha izimpendulo zakho.

Ucwaningo lufisa ukuba nabantu abayikhulu namashumi ayisithupha nambili ukuze sibe nolwazi olwanele. Umuntu ngamunye uzoba nethuba lakhe lokhuphendula uhla lwemibuzo egumbini elikhethekile. Angeke amagama abantu abhalwe phanzi. Yonke imibuze ephenduliwe izophathwa ngokukhulu ukucophelela ngebhokisi elivalekayo bese iyobekwa e hhovisi ekhabetheni elikhiywayo. Umcwaningi Kanye nomsizi wakhe kuphela abazokwazi ukubona lemininingwano. Imininingwano esekhomputheni yona izovalelwa ngephasi wedi. Ngemuva kweminyaka emihlanu yonke imininingwane izobulawa ngoku shredder Kanye noku dilitha.

UBUNGOZI NOMA UNGATHOKOZI KOMBAMBIQAZA: Abukho ubungozi okuzobhekana nombambiqaza kodwa ke makwenzeka angathokozi ngocwaningo angashiyaphansi nanoma isiphi isikhathi**.**

IZIZATHU EZINGADALA LOYO OBAMBE IQHAZA EKUTHENI AHOXHISWE KULELU CWANINGO: Uvumelekile ukuthi ungahoxa nanoma inini kulolucwaningo futhi angeke uphelelwe umsebenzi nxa uhoxa, inkinga ayikho neze.

IZINZUZO: Lokhu kuzosiza umqashi kanye nabasebenzi ukuthi babone izimo eziyingozi futhi bazivikele, bazothola ulwazi oluthe xha mayelana nokusebenza ngodoti onobungozi

AMAHOLO: Ngeke kube khona uhlobo lomholo. Ubamba iqhaza ngokuzithandela.

IZINDLEKO ZOCWANINGO: Ayikho imali ozoyikhokha futhi angeke ucelwe ukuba uhlanganisele nanoma yiziphi izindleko eziphathelene nesifundo.

IZIMFIHLO: Igama lakho angeke lize lidalulwe kulolucwaningo. Imininingwane ngawe izohlala

igodlekile. Ukuhlangana kwakho nomcwaningi kuzoba emagunjini afihlekile kwabanye abasebenzi akekho noyedwa ozokwazi ngawe. Umcwaningi uzozibophezela ngokusayinda itatiyela lezimfihlo kanti futhi imininingwano yocwaningo izogcinwa ngokuseqopheleni emakhabetheni ashicilelwayo. Yonke imibuze ephenduliwe izophathwa ngokukhulu ukucophelela ngebhokisi elivalekayo bese iyobekwa e hhovisi ekhabetheni elikhiywayo. Umcwaningi Kanye nomsizi wakhe kuphela abazokwazi ukubona lemininingwano. Imininingwano esekhomputheni yona izovalelwa ngephasi wedi. Ngemuva kweminyaka emihlanu yonke imininingwane izobulawa ngoku shredder Kanye noku dilitha.

IMIPHUMELA: imiphumela izovuleleka kubo bonke abantu kanti futhi umcwaningi uzobuya azoyifundela inkampani yonkana. Khumbula awekha amagama abantu azovezwa.

UKULIMALA OKUHLOBENE NOCWANINGO: Angeke zibekhona

UKUGCWINA KWEMANDELA ESEMAPHEPHENI KANYE NEQHISHIWE: Yonke imibuze ephenduliwe izophathwa ngokukhulu ukucophelela ngebhokisi elivalekayo bese iyobekwa e hhovisi ekhabetheni elikhiywayo. Umcwaningi Kanye nomsizi wakhe kuphela abazokwazi ukubona lemininingwano. Imininingwano esekhomputheni yona izovalelwa ngephasi wedi. Ngemuva kweminyaka emihlanu yonke imininingwane izobulawa ngoku shredder Kanye noku dilitha.

ABANTU ONGAXHUMANA NABO MAKUNENKINGA NOMA IMIBUZO: (Dr. Shanaz Ghuman, contact number: 031 373 2807) ungaxhumana nomgcwaningi u ̄Siphephile Myeni on 081 505 9878, umeluleki on 083 588 3245 or the Institutional Research Ethics Administrator on 031 373 2375. Amakhomplayini ungawaliphotha ku Director: Research and Postgraduate Support Prof K Motaung on 031 373 2577 or researchdirector@dut.ac.za.

APPENDIX D: CONSENT LETTER (ZULU)

KULUNGILE

Isihloko socwaningo: Ucwaningo lezifo nemithelela yezifo kubantu abaqoqa udoti onobungozi ezindaweni zokuhlanza udoti.

Igama lomcwaningi: Siphephile Myeni

Isitatimende Sesivumelwane Sokubamba iqhaza Esifundweni Sokucwaninga:

• Ngiyaqinisekisa ukuthi ngitshelwe umcwaningi, u-Siphephile Myeni ngokuqondene nemvelo, ukuziphatha, izinzuzo kanye nezingozi zalolu cwaningo.

• Ngithole futhi, ngafunda futhi ngiyaqonda imininingwane ebhaliwe ngenhla (incwadi yolwazi) mayelana nokucwaninga.

• Ngiyazi ukuthi imiphumela yocwaningo, kufaka phakathi imininingwane yomuntu mayelana nobulili bami, ubudala, usuku lokuzalwa, ukuqala kanye nokuxilongwa kuzokwaziswa ngokungaziwa embikweni wokutadisha.

• Ngokubheka izidingo zocwaningo, ngiyavuma ukuthi idatha eqoqwe phakathi nalolu cwaningo ingakwazi ukusetshenziswe ohlelweni lwekhompuyutha ngumcwaningi.

• Ngingakwazi, nanoma yisiphi isigaba, ngaphandle kokubandlulula, ngihoxise imvume yami nokuhlanganyela kulolu cwaningo.

• Nginethuba elanele lokubuza imibuzo futhi (ngokuzithandela kwami siqu) ngizibikezele ngikulungele ukuhlanganyela kulolu cwaningo.

• Ngiyaqonda ukuthi iziphumo ezintsha ezibalulekile zithuthukile phakathi nalolu cwaningo kungase kuhlobene nokuhlanganyela kwami kuzokwenziwa kimi.

_____ _____ _____ _____

Igama eliphelele lombambi qhaza usuku isikhathi Isiginesha

Mina, S. MYENI (igama **lomcwaningi) ngalokhu kuqinisekisa ukuthi umhlanganyeli ongenhla ugcwele ukwaziswa ngesimo, ukuziphatha kanye nezingozi zesifundo esingenhla**

SIPHEPHILE MYENI _____ _____ _____

Igama eliphelele lomcwaningi Usuku Isiginesha

_____ _____ _____

Igama eliphelele loFakazi Usuku Isiginesha

APPENDIX E: QUESTIONNAIRE (ENGLISH)

FACULTY OF HEALTH SCIENCES

An investigation into the occupationally risk factors and prevalence of communicable diseases amongst health care risk waste handlers at eThekwini District, Kwazulu-Natal.

Tick the appropriate box

Section A: Demographic Profile

1. **Gender**
   - ☐ Female
   - ☐ Male
   - ☐ other

2. **What is your highest level of education completed?**
   - ☐ No formal education
   - ☐ Primary school
   - ☐ Secondary school
   - ☐ Matric
   - ☐ Diploma
   - ☐ Adult Based Education (ABET)
   - ☐ Other specify----------

3. **What is your age group in years?**
   - ☐ Less than 21
   - ☐ 21-30
   - ☐ 31-40
   - ☐ 41-50
   - ☐ 51-60
   - ☐ 61-65
   - ☐ >65

4. **Ethnicity**

African	
Coloured	

Indian	
White	
Other	

If other specify----------

5. Employment Status

Full time	
Part time	
Contract	
Other	

If other specify----------

6. How long have you been employed for?

1-5 years	
6-10 years	
11-15 years	
16-20 years	
>20	

7. How often are you on shift?

None	
1-2 days a week	
3-5 days a week	
5-6 days a week	
Whole week	

Section B: Awareness and Knowledge in relation to waste management

8. What is your understanding about waste management?

_____
_____
_____
_____

9. What is your role as a waste handler?

_____
_____

_____

_____

		Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
10.	I received training regarding waste management					
11.	Waste management practices are clear and brief					
12.	I believe Health care risk waste is hazardous					

Section C: Awareness and knowledge in relation to handling HCRW

		Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
13.	Did you receive training on HCRW handling?					
14.	Was the training adequate and relevant to your daily duties?					
15.	Are health hazards communicated to all staff?					
16.	Do you believe handling medical waste can expose you to some diseases?					
17.	Are there any protective control measures in place?					

18. <u>Tick the PPE's you have been provided with.</u>

- ☐ gloves
- ☐ safety shoes
- ☐ overall suits
- ☐ face masks
- ☐ face shields
- ☐ goggles
- ☐ other, name the other **----------**

		Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
19.	Are the control measures effective?					
20.	Are you provided with Personal protective clothing (PPE)?					
21.	Do you use personal protective clothing all the time when handling waste?					
22.	Do you think Personal Protective Equipment (PPE) should be used when dealing with medical waste?					
23.	Do you believe personal protective clothing are effective?					
24.	Have you ever received hepatitis vaccination?					

25. When was your last hepatitis vaccination?

Within a year	
Between 5 years	
More than 5 years	
Never	
Do not know	

26. Since you started working for the company, have you ever been sick?

Yes	
Not sure	
No	

27. From what disease were you diagnosed with? (You can choose more than one)

- Cough
- Skin rash
- TB
- Hepatitis
- HIV
- Other specify ----------

28. Have you ever been injured from waste?

Yes	
Not Sure	
No	

29. What injury or incident did you experience?

- ☐ Needle stick prickle
- ☐ Contact with waste fluids
- ☐ Blood splash
- ☐ Other, Specify_____
- ☐ Not applicable

30. Did you visit a doctor or the clinic after your injury?

Yes	
Not sure	
No	
Not applicable	

Section D: General Attitudes

		Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
31.	Do you think that your employer is doing enough in providing a safe work environment?					

32. What are your suggestions on improving your safety in the workplace?

_____

_____

_____

		Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
33.	Do you think you need additional training regarding the health hazards associated with handling medical waste?					
34.	Are there rewards or compliments on good waste management practise?					

Thank You

APPENDIX F: QUESTIONNAIRE (ZULU)

ISIKOLO SESIKHATHI SEMPILO

UCWANINGO LEZIFO NEMITHELELA YEZIFO NXA USEBENZA NGODOTI ONOBUNGOZI WASEZIBHEDLELA, KWAZULU NATAL.

Khetha okufanele

ISIGABA A: IPHROFAYLI YEZENHLALAKAHLE

1. **Buthini ubulili bakho?**
- owesifazane
- owesilisa

2. **Cela ubonise izinga lakho eliphakeme lemfundo oliqediwe:**
- angifundanga
- emazingeni aphansi
- emazingeni aphezulu
- Matikuletsheni
- inyunivesithi
- imfundo yabadala (ABET)
- Okunye,kucacise …….

3. **ithini iminyaka yakho?**
- Ngaphansi kuka 21
- 21-30
- 31-40
- 41-50
- 51-60
- 61-65
- 65 nangaphezulu

4. **Uluhlanga luni?**

Um Afrika	
khaladi	
Indiya	

umhlophe	
Olunye uhlanga	

Olunye uhlanga chaza----------

5. **Isimo sokusebenza noma sokuqhashwa**

Ngokuphelele	
Ngokungaphelele	
Nkotilaki	
Okunye	

Chacisa okunye----------

6. **Ususebenze iminyaka emingaki nalenkampani?**

0-5 yeminyaka	
6-10 yeminyaka	
11-15 yeminyaka	
16-20 yeminyaka	
Ngaphezu kwa 20 yeminyaka	

7. **Uza kangaki emsebenzini ngeviki?**

Lutho	
1-2 wezinsuku evikini	
3-5 wezinsuku evikini	
5-6 wezinsuku evikini	
Iviki lonke	

Isigaba B: Ukuqwashisa kanye nolwazi mayelana nokuphathwa kuka doti

8. **Kuthini ukuqonda kwakho mayela nokuphathwa kukadoti?**

_____

_____

_____

_____

9. Iyini indima yakho maku njengomuntu osebenza ngodoti?

_____

_____

_____

_____

		Ngiyavuma kakhulu	**ngiyavuma**	**Anginaso isiqiniseko**	**ngiyaphika**	**Ngiyaphika kakhulu**
10.	Ngabe uqheqheshiwe mayelana nokuphathwa kuka doti?					
11.	Ngabe imigomo yokuphatha udoti icacile futhi iyezwakala?					
12.	Uyakholelwa ekutheni udoti unobungozi					

Isigaba C: Ukuqwashisa kanye nolwazi mayelana nokuphathwa kuka doti onobungozi

		Ngiyavuma kakhulu	Ngiyavuma	Anginaso isiqiniseko	ngiyaphika	Ngiyaphika kakhulu
13.	Uke waqeqeshwa ngokuphatha udoti onobungozi?					
14.	Ngabe loluqeqesho belwanele futhi ludingeka ngokomsebenzi wakho wansukuzonke?					
15	Ngabe imithelela eyingozi empilweni zenu ngokomsebenzi nazisiwe yini ngazo??					
16.	Uyakholelwa ekutheni udoti onobungozi ungakugulisa na?					

17.	Ngabe zikhona yini izindlela zokuzivikela ezibekiwe?					

18. Khetha izimvikela kusebenza ozitholayo emsebenzini.

- amagilavu
- izichathulo zokuphepha
- ama overals
- I mask
- face shields
- goggles
- okunye, ngicela ukubhale **----------**

		Ngiyavuma kakhulu	**ngiyavuma**	**Anginaso isiqiniseko**	**ngiyaphika**	**Ngiyaphika kakhulu**
19.	Ngabe lezizindlela ozivezile ziyanivikela na?					
20.	Niyazithola yini izinsiza kusebenza sokuzivikela?					
21.	Ngabe uyazisebenzisa yini lezinsiza kusebenza mawuthinta udoti onobungozi?					
22.	Ucabanga ukuthi zinesidingo yini lezinsiza kusebenza nxa uphethe udoti onobungozi?					
23.	Ngabe ziyakuvikela ngampela na ezifweni lezinsiza kusebenza?					
24.	Uke wajovela i hepatis?					

25. Ukujova kwakho kokugcina bekunini?

Awukapheli unyaka	
Phakathi kweminyaka emihlanu	
Ngaphezu kweminyaka emihlanu	
Angikaze ngijove	
Angazi	

26. Usuke wagula yini selokhu waqala kusebenzela lenkampani?

Ngiyavuma	
Angazi	
Ngiyaphika	

27. Cela ucaze izimpawu zezifo sakho? (ungbakhnetha ngaphezu koku kodwa)

- ukukhwehlela
- isikhumba
- TB
- Hepatitis
- HIV
- Okunye: chaza ----------

28. Usuke walimala emsebenzini?

Ngiyavuma	
Anginaso isiqiniseko	
Ngiyaphika	

29. Ulimale ngadlela yini?

- Uhlatshwe umjovo
- Ukuthintana noketshezi ladoti
- Uthelwe igazi
- Okunye, chaza_____
- Akungeni

30. Uke waya emtholampilo noma wabona udokotela ngemuva kwesehlakalo?

Ngiyavuma	
Anginaso isiqiniseko	
Ngiyhaphika	
Akungeni	

Isigaba D: Izinqondo nemibono

		Ngiyavuma kakhulu	Ngiyavuma	Anginaso isiqiniseko	ngiyaphika	Ngiyaphika kakhulu
31.	Uzizwela uphephile, ubona ngathi umqashi wenza konke okusemandleni ukunigcina niphephile?					

32. Ithini imibono yakho kuze sibengcono isimo sezokuphepha emsebenzini?

_____

_____

_____

_____

		Ngiyavuma kakhulu	Ngiyavuma	Anginaso isiqiniseko	ngiyaphika	Ngiyaphika kakhulu
33.	Ngabe ubona kunesidingo sokuthi niqeqeshwe futhi mayelana nokuphatha udoti wasezibhedlela onobungozi?					
34.	Ngabe niyathola imikomelo kuze uqhuqhuzeleke ngokulandela imigoma yokuphatha udoti.					

Ngiyabonga

APPENDIX G: ETHICS APPROVAL

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
3rd Floor, Berwyn Court
Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375
Email: irec@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

4 November 2020

Ms S I Myeni
33 Panorama View
Kudu Street
Constantia Kloof
Roodepoort
1709

Dear Ms Myeni

An investigation into the occupational risk factors and prevalence of communicable diseases amongst health care risk waste handlers in treatment plants at eThekwini District in KwaZulu Natal (KZN)
Ethical Clearance number IREC 108/20

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC Standard Operating Procedures (SOP's).

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely,

Prof J K Adam
Chairperson: IREC

APPENDIX H: GATEKEEPER APPROVAL

COMPASS™
Medical Waste Services

Safety. Quality. 100% Committed.

Ms S I Myeni
33 Panorama View
Kudu street
Constantia Kloof
Roodepoort
1709

27 October 2020

Dear Ms Myeni

Approval to conduct survey at Compass Medical Waste Services, Westmead treatment plant

We hereby grant approval to carry out questionnaires with our employees for your thesis study into the occupational risk factors and prevalence of communicable diseases amongst health care risk waste handlers in the eThekwini district.

Please take cognisance of the below:

- We wish to advise that in terms of protecting our intellectual property, we will not allow full copies of documents, other than those which are in the public domain such as licences and permits, to be taken off site
- Questionnaires must be conducted in such a way as to not affect the operational requirements of the business

We understand that the study is purely for educational purposes

27/10/2020
Section 16(2) appointee **Date**

27/10/2020
Date

Acceptance

I, **Ms S I Myeni**, hereby understand the above conditions regarding the completion of the thesis study

Student **Date**

compasswasteservices.co.za

Compass Medical Waste Services (Pty) Ltd
Reg. No. 2003/002007/07
Directors: CA Coleman, IC du Randt, GC du Randt, AC Moodley

KwaZulu-Natal Westmead
17 Monte Carlo Road,
Westmead, 3610
P O Box 1690, Westville, 3630

Tel: 031 792 4200
Fax: 086 574 3612
Email: sales@compass.za.net

APPENDIX I: LETTER FROM EDITOR

EDITING / PROOFREADING CERTIFICATE

Editor details

DR NELLIE NARANJEE
Doctorate Nursing, MBA, MCur .
Freelance academic editor: Blackford Institute, UK

Contact details
Mobile : 0825776126
Email : naranjeen@gmail.com / NellieN1@dut.ac.za

Author: Ms Siphephile Innocentia Myeni

Masters Dissertation : An investigation into the occupational risk factors, and prevalence of communicable diseases amongst health care risk waste handlers at a treatment plant at Ethekwini District in Kwazulu-Natal, South Africa.

Student number :

This is to certify that the above manuscript has been proofread and edited for English language grammar, punctuation, spelling, writing style, clarity, sentence structure and layout. The document is formatted according to the institutions requirements and guidelines. The logical presentation of ideas and the structure of the paper were also checked during the editing process. Neither the research content nor the author's intentions were altered in any way during the editing process.

I am a freelance editor specialising in proofreading and editing academic documents. All amendments were tracked with the Microsoft Word " Track Changes " feature and the document was returned to the author.The author has the option of accepting or rejecting each change individually. The author remains responsible for the correct application of the changes in the text and references.

I wish the authors all the best.

_____ 29 July 2022

DR NELLIE NARANJEE **DATE**