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UNIVERSITY OF GHANA

COLLEGE OF HUMANITIES

DEPARTMENT OF GEOGRAPHY AND RESOUCE DEVELOPMENT

KNOWLEDGE, ATTITUDE AND PRACTICES OF HEALTHCARE WASTE MANAGEMENT AND RISK PERCEPTION IN HO MUNICIPALITY

SUBMITTED BY

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(10243328)

THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF PHILOSOPHY (MPHIL) IN GEOGRAPHY AND RESOURCE DEVELOPMENT DEGREE

APRIL, 2022

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DECLARATION

I hereby declare that this work is the result of my own research and has not been presented by anyone for any academic award in this or any other university. All references used in the work have been duly and wholly acknowledged. Any deficits therein are my sole responsibility.

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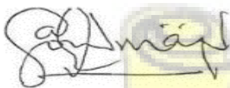

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(Co-Supervisor)

INTEGRI PROCEDAMUS

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DEDICATION

To my late parents Mama Ketor III (Selina Aku Amegago) and E. K. A. A Dzakuma, whose parental care, love, guidance, encouragement and tireless efforts in ensuring I reach the pinnacle of my educational career did not live to see the end of this work.

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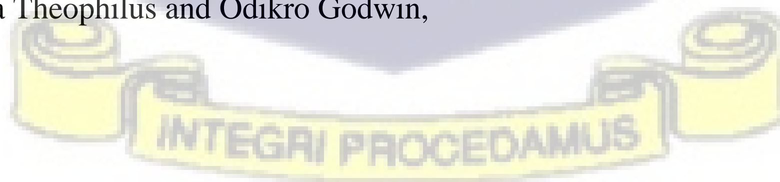

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ABSTRACT

Globally, there exist a well-defined set of rules for handling healthcare waste; but the slackness and lack of adequate training and awareness in the implementation of n legislative and regulatory policy guidelines lead to serious health and ecological trepidation. The present study was conducted to assess the level of awareness of healthcare waste management amongst health personnel and the perceptions regarding the potential risks associated with waste, through mixed-method approach of data collection. Simple random sampling was used to select 165 health personnel from the Municipal Health Directorate. Quantitative data was analysed using SPSS chi-squares and the level of significance set at $P \leq 0.05$. Descriptive statistics were carried out to determine relative percentages. Results show that the total level of awareness of health care waste management amongst staff among highest in Doctors, followed by laboratory technicians, nurses, health assistants and lastly was at personnel 1%, 75%, and 68.9%, 60% and 35.7% respectively. The study uncovered that majority of health personnel were not aware of the Ministry of Health Guidelines on the management of healthcare waste. Chi-square test of association between a health worker's profession and level of knowledge of healthcare waste management ($\chi 2 = 13.704$; $p = 0.008$ at 0.05 significance level) depicted health personnel's job the type affects level of knowledge of healthcare waste management. Similarly, chi-square test of association between job category health personnel risk perception about infection from infectious waste ($\chi 2 = 20.278$; $p = 0.009$ at 0.05 significance level) indicated health personnel's risk perception was influenced by their job type. The study recommends the need to have specialised waste workers is very essential or the training of the existing personnel on effective healthcare waste management as only 35.7% of current waste personnel indicated their knowledge in waste management as good.

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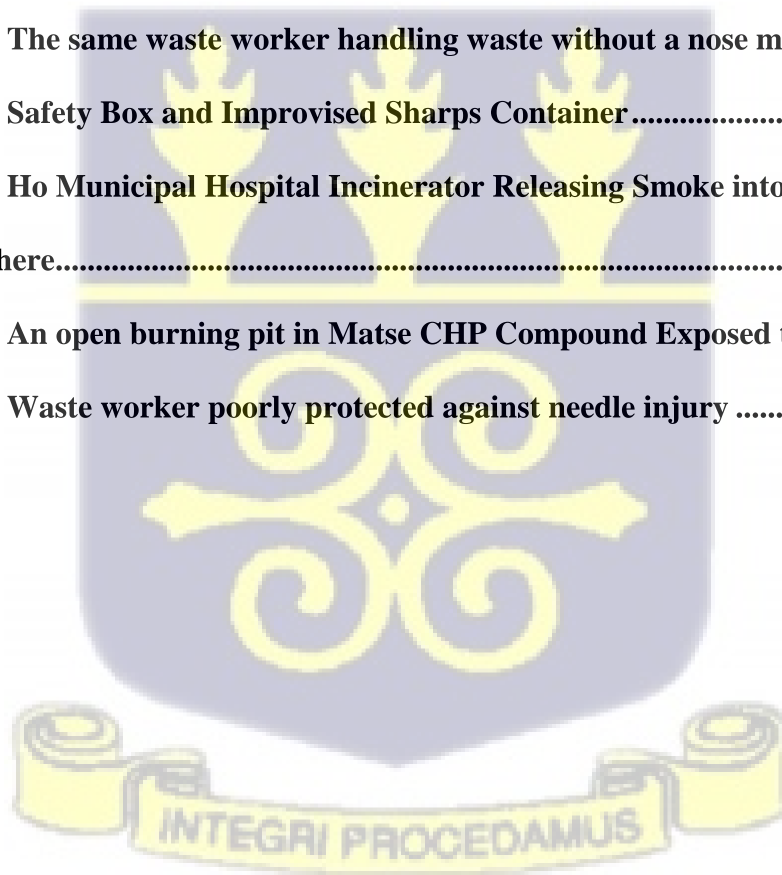

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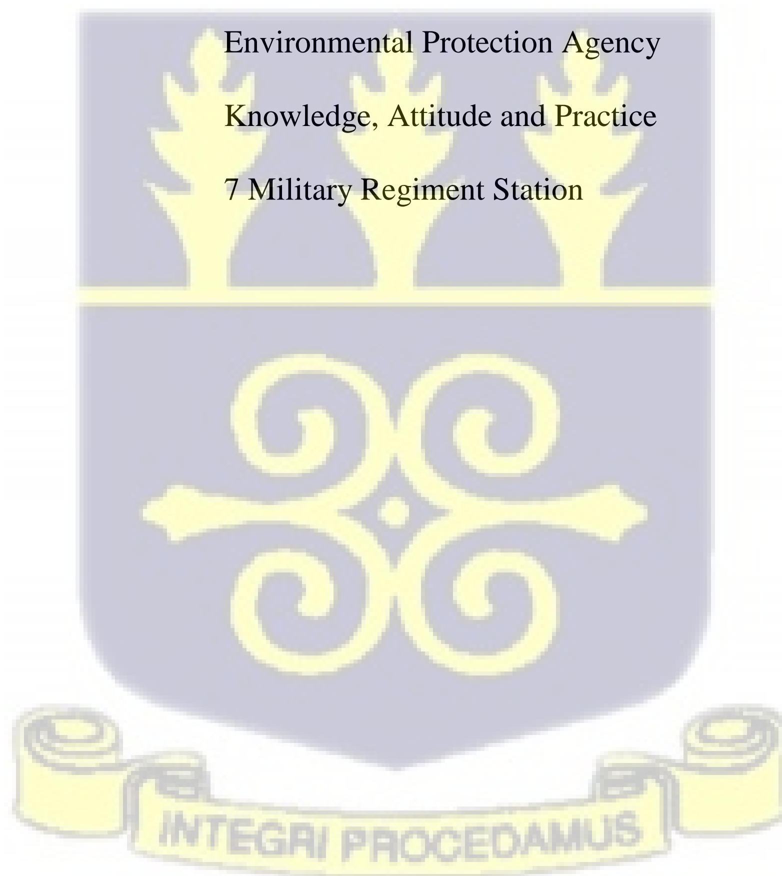
LIST OF ABBREVIATIONS

WHO	World Health Organisation
HCW	Health Care Waste
HCWM	Health Care Waste Management
MOH	Ministry of Health
UNEP	United Nations Environment Programme
ISWA	International Solid Waste Association
MLGRD	Ministry of Local Government and Rural Development
MMDA	Metropolitan Municipal and District Assembly
EPA	Environmental Protection Agency
KAP	Knowledge, Attitude and Practice
7MRS	7 Military Regiment Station



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CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Healthcare institutions generate waste such as tissue, sharps, office garbage, patient waste and other harmful materials in the pursuit of minimizing health-related problems and delivering patient care services (Ranjbari et al., 2022; WHO, 2014; Hossain et al., 2011). According to the literature, healthcare waste management has received very little attention in poor nations than municipal solid waste and electronic waste (Breukelman, Krikke and Lohr, 2019; Adediga et al., 2010; Coker et al., 2009). Healthcare waste, which is also referred to as biomedical or medical waste, refers to the various types of waste generated by health facilities, research laboratories, disaster relief efforts and home healthcare services (Doylo et al., 2019; WHO, 2011).

In the course of treating patients and preventing diseases, the health sector is increasingly producing waste (Kenny and Priyadarshini, 2021). These wastes (HCW) is noted to have a significant impact on environmental sustainability, the patient, healthcare workers as well as public health (Doylo et al., 2019; Alharbi et al., 2021). Following its negative consequences, HCW necessitates adequate treatment, management, and efficient disposal procedures in order to mitigate its negative consequences (Alam and Mosharraf, 2020). Healthcare waste is the second most dangerous waste, behind radioactive waste, according to the Basel Convention (1992). This makes it one of a problem for most healthcare facilities in many impoverished countries of the world (Abah and Ohimain, 2011). Healthcare wastes have been noted to have endangered the existence of persons, other living organisms as well as natural resources or ecosystems essential for human existence (Ali, Wang, and Chaudhry, 2016; Guerrero et al., 2013). It is noted that the safe management of the increasing

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quantities of healthcare wastes generated especially in developing countries have not developed swiftly (WHO, 2016). This has led to the development of brown environments in some countries. Globally, the estimated quantity of healthcare waste generated per person ranges from 0.5kg to 2kg per bed per day (WHO, 2016; 2005). According to WHO, healthcare waste is distinct, due to its probable hazards to human life and the environment (WHO, 2016) and that some types of wastes arising from the activities of healthcare facilities are very lethal and risky (Shi et al., 2017; Babanyara et al., 2013; Sawalem et al., 2009). It is also acknowledged that healthcare waste contains toxic substances that are very injurious to health which may perpetuate disease transmission (Yazie et al., 2019; Chintis et al., 2004). Correspondingly, in 2010, 1.7 million hepatitis B infections, 33,800 HIV infections and 315 000 hepatitis C cases were recorded worldwide (WHO, 2013). Literature reports that the hazardous nature of certain categories of healthcare waste arise due to the following physiognomies: the presence of infectious agents, sharps and genotoxic substances. Sharps in particular are reported to be responsible for most accidents reported in literature (Khan et al., 2019; Thakur and Ramesh, 2015).

Concerns regarding the possible problems associated with healthcare waste cause was emphasised by a survey of twenty-two (22) developing countries in 2002. It was established that the percentage of facilities that practice unsuitable healthcare waste disposal methods ranges from 18 percent to 64 percent (WHO, 2016; 2004). It is estimated that 75–90% of wastes generated in healthcare institutions comprise non-risk or general healthcare wastes that are analogous to domestic wastes (Edris, Tamir and Sisay, 2022; WHO, 2016; Pruss et al., 1999). However, the remaining of 10-25% noted to be risky and may create several hazards. Consequently, the total stream of waste from healthcare is either labelled as non-hazardous or hazardous depending on the material

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content and level of toxicity. It is contended that if medical or infectious waste, is not properly managed, it poses substantial health and environmental dangers (WHO, 2017; Chartier et al., 2014; Windfeld and Brooks, 2015). Usually of concern is the management of hazardous waste because if it mixes with non-hazardous waste can increase the toxicity of entire waste stream generated and can be a potential source of risks to doctors, nurses, other paramedical staff and visitors (Ničić et al., 2017; Mohiuddin, 2018; WHO, 2016; Pruss et al.,1999).

In some countries, there is growing awareness on uncontrolled and mismanagement of hazardous healthcare waste which could be a prospective source for the spread of diseases (Ferronato and Torretta, 2019; Niyongabo et al., 2019; Liu et al., 2015). In environs where poor and inappropriate practices of waste management are noticed, exposure to contagious waste streams by health personnel, patients and other paramedics may create varied infections due to the presence of blood borne pathogens in waste streams (Thakur and Ramesh, 2017; WHO, 2016). Studies have acknowledged these inappropriate healthcare waste management practices in Nigeria, Ethiopia and Libya (Deneke et al., 2011; Abah and Ohimain, 2011; Badi, Shetwan and Hemeda, 2019). Moreover, concerns have been raised on mishandling of healthcare waste more importantly in developing countries as it could be a significant risks factor to disease transmission. For instance, in India in 2009, sixty people lost their lives due to an outbreak of hepatitis B in Gujarat. The deaths were as a result of the reuse of injection apparatus (Guerrero et al., 2013). The Centre for Disease Control (CDC) in the United States of America realised fifty-two (52) HIV infections as work-related infections and 45 of these were due to transdermal exposure (CDC, 1997). Sharps in particular, are said to represent double risks because they cause both physical wound and contaminate injuries when infested with pathogens (WHO, 2016; 2010). Two million or more of

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healthcare workers are estimated to be exposed to transdermal injury with disease-ridden sharps annually (Riddell, Kennedy & Tong, 2015; Pruss et al., 2005). It is opined that in India the precise meaning of HCW among health personnel found to be the highest among laboratory personnel and lowest in housekeeping employees but were able to identify the correct colour-coding system for waste segregation (Sharma and Gupta, 2017; Thakur and Anbanandam, 2016; Sehgal et al., 2015). In Pakistan, it was revealed that knowledge on infectious waste management was higher in doctors and nurses than other workers due to differences in educational levels, work experience, training and the practical involvement in healthcare waste handling. Similarly, it was found that practices on the management of infectious waste to be poor amongst sanitary workers because they could not apply the right colour coding system and the use personal protective equipment (Ziraba, Haregu and Mberu, 2017; Kumar et al., 2015; Ramesh et al., 2013). Likewise, studies have found that not all health personnel knew the consequences of needle stick injuries though personnel were aware of waste management rules while knowledge on needle stick injuries and the awareness of their consequences were high among personnel (Ravishekar et al., 2016). Similarly, a comparative study of healthcare waste management before and after training of doctors in India concluded that training programs are central to the effective management of waste from healthcare facilities. Accordingly, inadequate resources affect prioritising and given healthcare waste management its needed attention as well as issues of incomplete segregation of infectious waste that typically mix with non-infectious waste to increase the toxicity of waste streams (Wafula et al., 2019). Again, to others consider factors such as the type of healthcare facility and its waste management structure, size of the facility, human resource, monitoring and control, regulation and policy amongst others play very critical roles in enhancing healthcare waste management (Chauhan &

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Singh, 2017). Equally studies in Egypt have revealed that training and duration of work experience influenced the handling and management of healthcare waste while personnel had some level of knowledge in the management of waste (Elnour, et al., 2015; Hakim, Mohsen & Bakr, 2014). In addition, it has been discovered through a cross sectional study that trained healthcare workers had good knowledge, attitude and practice regarding healthcare waste management compared to paramedics and orderlies (Anand et al., 2016). Similarly, a study in Bagepalli Taluk; found the absence of knowledge on the awareness of healthcare waste management and this led to poor practices in waste handling and management because no form of in-service training on HCWM was carried out (Nagaraju et al., 2013). Parallel to the above, a survey established the absence of healthiness and safety precautions in the training curricula for health personnel. Conclusions of the survey advocated for extensive training programmes for healthcare employees which must contain safety and health tips (Mwania, 2019; Njue, Cheboi and Ovie, 2015; Nkonge et al., 2012). Also, human resource factors, role of health managers and waste management implementation have all be shown to influence healthcare waste management (Khan et al., (2017). However, the improper handling of healthcare wastes pollutes the environment much more (Ju et al., 2020; Baghapour et al., 2018; Khan et al., 2019; Olaniyi, Ogola & Tshitangano, 2021). As a result, all HCWs must be correctly segregated at the point of generation, correctly treated, and disposed of with care (WHO, 2013; Badi et al., 2019). Due to the infectious nature of the HCW, improper waste treatment practices and incorrect waste disposal techniques pose significant health risks and environmental damage (Minoglou et al., 2017; WHO, 2013).

Literature on the management of healthcare waste in Africa assert that the practice is in its embryonic stage typified by the absence of complete healthcare waste legislation in

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some countries coupled with high prevalence of defiance in countries and health facilities where wastes handling laws even exist (Mol et al., 2022; Zatar, 2019; Oli et al., 2016; Bendjoudi et al., 2009; Coker et al., 2009; Udofia, Fobil and Gulis, 2014; Soliman et al., 2007). In view of this, a guidance and training handbook for handling harmful healthcare waste in emergent economies to serve as a foundation for the effective management of healthcare waste (Mavropoulos, ISWA, SA, 2010). Hence, to ensure the effective and efficient management of healthcare waste in health institutions, proper planning is needed to safeguard the health of personnel, patients and the public. Thus, planning should define the strategies that would be employed in implementing improved methods of waste management, because disposal practices could be poorly conducted and inadequately supervised even though clear and definite working guidelines as well as strict legislative controls may be in place. In Ghana, issues of healthcare waste management are contained in number of statutory regulations amongst them are; the constitution of Ghana, the Environmental Protection Agency of 1994 (Act 490), Environmental Legislative Instrument of 1999 (LI 1652) and The Local Government Act of 1993 (Act 462). These Acts have specific roles in relation to waste emanating from healthcare activities but these are not definitive and specific to healthcare waste. A survey of waste management in both private and public health facilities revealed current waste management practices to be sub-standard and not in conformity with internationally accepted practices (Abor, 2012); with unfitting segregation of waste, burning and inadequate incineration and inadequate training noted as common practices that can increase the risk of infection (Abor and Bouwer, 2008; Odonkor and Mahami, 2020; Akum, 2014).

The Ministry of Health mandates that distinct categories of healthcare waste be collected in color-coded bins, with the use of yellow for infectious waste, brown for

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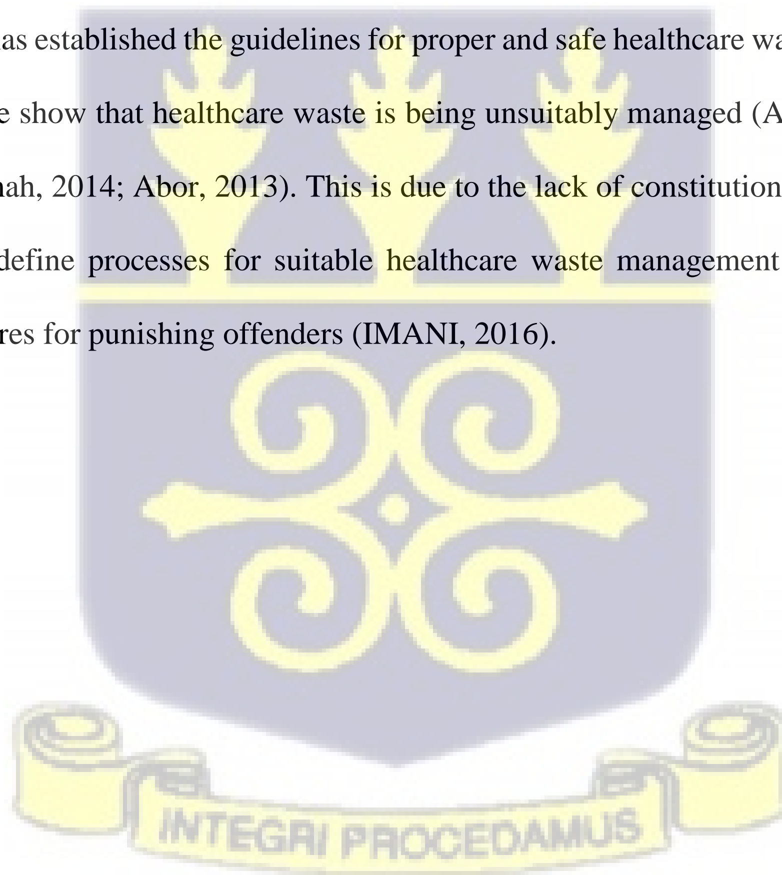
expired medications, waste from vaccinations and chemicals and black bins for the collection and storage of general waste. The MOH guidelines also stipulate that any waste that is being generated by the health facilities should not be left at the point of generation for more than 24 hours (MOH, 2006; 2009). However, it is opined that general waste can be disposed of in landfills (Amfo-Out and Doo, 2015; MOH, 2009). On the part of radioactive waste, the radiation protection board receives radioactive waste for treatment involving disinfection, stream autoclave, sterilisation and incineration and final disposal at a landfill. Likewise, it has been stated that the institution and implementation a healthcare management law is a crucial pre-requisite for successful biomedical waste management (IMANI, 2016). Despite the fact that Ghana has established the guidelines for proper and safe healthcare waste management, literature show that healthcare waste is being unsuitably managed (Asante, Yanfu and Yaokumah, 2014; Abor, 2013). This is due to the lack of constitutional provisions that clearly define processes for suitable healthcare waste management as well as legal procedures for punishing offenders (IMANI, 2016).



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1.2 Problem Statement

Though healthcare facilities play a focal role in ensuring the upkeep of health, nonetheless, these facilities also have surprisingly unhealthy sides that affect the very populations they protect and contribute to illness and pollution (Thakur and Ramesh, 2016; Minoglou et al., 2017: WHO 2013, 2005) and noted to plays a role in the diffusion and escalation of diseases in developing countries (Shareefdeen, 2022; Sarkodie and Owusu, 2021; Shinee et al., 2008). Besides healthcare waste is assumed to present greater risk to health than the poor management of municipal waste (Hassan and Shareefdeen, 2021: WHO, 2016; Chartier, 2014; Pruss-Ustun, 1999). Contrary, suitable management practices minimise risks to public health. Efforts to enhance the effective management of healthcare waste and to reduce HAIs. Thus, this led to the institution of healthcare waste management policy in 2006 and the national infection prevention and control policy in 2015 (Ministry of Health, Ghana, 2015). Prior to the MOH policy guidelines, the total handling of healthcare waste was left to each facility. Facilities were to devise their own plans and strategies in managing healthcare waste (MOH, 2006; Abor, 2012). Yet, current challenges akin with total handling of healthcare waste in Ghana is not well documented, though this serves as the basis for appropriate policy formulation and workable waste and resource strategies.

The question that arises is, are healthcare facilities able to manage their wastes effectually following the institutions of the guidelines? Lack of training, improper oversight responsibilities and the lack of policies guidelines, inadequate equipment supply, non-labelling, non-adherence to segregation practices, ineffective liquid waste treatment, ineffective monitoring and supervision have been noted as catalysts to ineffective waste management in Ghana (Acheampong 2016; Asante, Amoako and

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Dente, 2018; Ofosu et al., 2016; Abor, 2013; Oduro-Kwarteng, Addai and Essandoh, 2021; Asante, Yanful and Yaokumah, 2014; Akum, 2014; Wiafe et al., 2016).

In the Ho municipality, issues about healthcare waste management are typically addressed during peer reviews (Municipal Health Directorate, 2016).

After a number of hospital visits and consultation with key stakeholders, the researcher identified a major issue in healthcare waste management in the study area. During the reconnaissance stage, I observed that almost all the facilities visited had their waste transported in raw states to the final disposal sites excepts for sharps that were brought to the regional hospital for incineration. I also observed the use of firewood for the incineration of some wastes including sharps. According to a waste worker I spoke to, healthcare waste must be incinerated with gas but the absence of the gas made them to resort to the use of the firewood. The incineration of waste including sharps according to a waste worker is not very effective since the firewood is unable to produce the required temperature needed to properly incinerate wastes. It was also realised during the initial visits that, some small facilities such as CHPS Compounds had only the black bib liners for both infectious and general waste. Thus, waste can be said to disposed without proper treatment. Thus, the lack of proper and effective treatment solutions for all healthcare facilities, small hospitals and clinics- both public and private fall short of the nationally accepted guidelines or standards. This calls for investigation to ascertain the gaps in policy and practice. Moreover, at the time of this research, all online searches did not make available any such document on the management of healthcare waste in the Ho Municipality and Volta region as a whole.

From the foregoing, gaps exist in literature between policy and practice. Thus, I argue from this that, though the adoption of the MOH guidelines a significant improvement healthcare waste practices may not be found in reality. As a result, additional study is

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required to address this weakness. Findings will add to existing knowledge on healthcare waste management through the assessment the disparity in policy and practice underpinned by the knowledge, attitudes and practices model.

1.3 Research Questions

Particularly the study seeks to answer the following questions:

1. What is the current knowledge, practices and attitudes of healthcare personnel on the management of healthcare waste in relation to MOH guidelines?
2. Is waste segregated in healthcare facilities?
3. What are the levels of perceived risk associated with healthcare waste?
4. What are the pitfalls in the management of healthcare waste?
5. What injuries occur among health personnel?

1.4 Aims and Objectives

The need to mitigate potential injury to people and the environment and to ensure that, best waste management practices are carried out is the principal reason for this case study. Against this backdrop, the sub objectives of this research are to:

1. Assess the knowledge, attitudes and current practices about healthcare waste management and how these fit into the MOH guidelines.
2. Examine the state of waste segregation practices in the healthcare facilities in the study area.
3. Assess the risks perception towards healthcare waste amongst health personnel
4. Ascertain the challenges encountered in the healthcare waste management.

INTEGRI PROCEDAMUS

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1.5 Research Proposition

Healthcare waste especially hazardous waste is re-counted to be of no health effect to public health, however poor management and disposal procedures can heighten injury and disease contraction in vulnerable groups such as waste workers.

1. There is low adoption of statutory practices in HCWM
2. Needle injuries occur more in nurses than other healthcare personnel.

1.6 Justification of the Study

The management of waste emanating from health activities is a major challenge in the world, Africa and subsequently the country Ghana in recent times. It has become a developmental issue as its mismanagement may have dire consequences for humans and the environment as well. This therefore deserves not the attention of only the Ministry of Health and its relevant agencies and stakeholders in the case of Ghana but also that of corporate institutions and individuals as a way of finding solutions to the bottlenecks allied with healthcare waste management.

Against this background, the study assessed the knowledge base of healthcare staff on healthcare waste, the procedures involved in the management of waste and the main challenges inherent in the management processes and its associated perceived risks.

Findings from this study would serve as a useful guide for formulating policies aimed at enhancing the management of healthcare waste through the strengthening of institutional lapses regarding the application of best practices and the promotion of regulatory compliance on waste management not only at the Municipal level but also at the national level. The study is envisaged to also aid in curbing health hazards and risks that could arise due to the mismanagement of healthcare waste. Further, the study

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is expected to give an understanding to stakeholders regarding the bottlenecks associated with healthcare waste management in the Ho Municipality.

1.7 Scope of the Study

Geographically, the study covers the Ho Central Municipal Assembly. This area was chosen because; it is an expanding urban setting just as Accra, Sekondi-Takoradi and Tamale. It also hosts a number of health facilities including a referral and military facilities whose activities generate waste of both hazard and non-hazardous nature. Contextually, the study focused on the management of healthcare waste by assessing the knowledge level of health personnel in the study area, the observable attitudes during waste management and the practices adopted in the management of healthcare waste to unearth the disparity in policy and practice.

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CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0. Introduction

The chapter deals with literature on healthcare waste and its management. The chapter is itemised thematically with appropriate headings regarding the various themes to be looked at. It focuses amongst others-the meaning of healthcare waste, categorisation of healthcare waste, management of healthcare waste, knowledge, attitudes and practice of waste management, perception of healthcare waste, legislative and regulatory framework, risk perception, segregation of waste and healthcare waste management in Ghana. The chapter culminates with a summary of the main issues addressed.

2.1. Meaning of Healthcare waste

Waste generated in health facilities across the globe are diverse and as such definitions vary. Contingent on the geographical location as well as the place and the section of the healthcare facility it waste is generated, the definition or meaning of waste may differ. *Healthcare waste is any undesirable material originating from care facilities, research centres and laboratories or associated to medical procedures* (WHO, 2014). It also deals with waste generated from minor and scattered sources such as home care such as home dialysis. In Botswana, waste from healthcare facilities is referred as clinical or medical. This definition according to the WHO, could be a source of misconception to lot of authorities because not every waste generated is of clinical nature (WHO, 2014). Thus, medical waste is just a subset of the whole waste stream that originates from health-related activities. In Ghana and according to the MOH, healthcare waste is defined to include all untreated waste-both solid and liquid that may be risky and non-

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hazardous produced throughout the delivery of medical care of any medical research relating to animals and humans (MOH, 2006).

2.2. Waste generation, records, categorisation and management Practices

Knowing the various types and quantities of waste generated in each facility is a significant step in safe disposal (Jovanovic, 2016; Chartier, 2014). Data on the quantity of waste generated is used in the estimation of required volumes for containers, storage areas and the transportation and treatment technologies (Saad, 2013; Alwabr et al., 2016; Al-Katib, Eleyan and Garfield, 2016). Besides, waste generation data is used to establish baseline data on the rates of production in different medical areas and for procurement stipulations, budgeting, optimization of waste management systems, planning, calculating revenues from recycling and to perform ecological impact assessments (Maamari et al., 2015). A cross sectional study to measure the healthcare waste generation rate, composition and practices in Kumasi determined the average waste generated to be within the region of 0.76kg to 2.92kg/bed/day for hospitals and 0.012kg to 0.08kg/patient/day for health centres (Oduro-Kwarteng, Addai and Essandoh, 2021). The authors indicated the compostion of hazardous to general wastes as 49.7% and 50.3% respectively. This shows a poor segregation practice in the survey facilities because, the internationally acceptable threshold for hazardous waste is 10-25% (WHO, 2014). In a respective study, using mixed methods estimated the average daily quantity of solid waste of two hospitals as 247.11kg and 227.56kg for Tamale Central and West hospitals respectively (Asante, Amoako and Dente, 2018). This study however revealed a low composition of infectious or hazardous waste representing 7.56% while general waste accounted 79.26%. This incidence of increased quantity or composition of hazardous waste implies increased toxicity of the waste, and can lead

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to disease transmission. The best and effective method of obtaining waste generation rates is through quantitative waste assessments (Ferronato et al., 2020). However, the estimation of the quantity of waste generated is not the focus of the current study but it is intended to give an overview of waste generation rates in the country were applicable. The components of an assessment include the definition of goals, enlistment of cooperation staff, planning, equipment procurement data collection, analysis and recommendations. Any waste assessment process gives the opportunity to improve current practices, determine potential for waste minimization and to sensitise health personnel. For instance, the implementation of rigorous segregation can avoid over-sizing of equipment and results in cost savings. Similarly, a study estimated the average waste quantity per day in Nigeria. The average quantity of waste was estimated at 0.62kg/patient/day at the out-patient units and 0.81kg/patient/bed/day in the in-patient wards (Abah and Ohimain, 2011). Likewise, the waste generation rates in four hospitals to determine the feasibility of the waste for energy recovery found the quantity of waste generated at 1.34, 1.02, 1.1 and 0.76kg/capital/day for each of the hospitals (Mwaria, Kaseva and Manyele, 2021). Moreover, an experimental research to investigate the management of clinical liquid waste in three Ghanaian healthcare facilities found disparate levels of clinical liquid waste generation amongst the facilities sampled (Accra-Ghana, 2016). To ensure that waste generation are estimated, the MOH policy framework charges every health facility to keep records of quantities of waste generated either by the institution itself or through the services of a waste management company. For proper waste generation data to be kept for planning, issues regarding type of waste, place of generation, at what time separated and by whom as well as other successive actions till final disposal is achieved must be noted (MOH, 2006). Records on waste generation wastes must have the following in place- date, kind and volume of waste

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generated, origin and weight of waste received from other facilities, means of transportation including the volume and type of waste transported, particulars of commissioned waste contractors if any, disposal methods and quantities involved. Likewise, all records of ecological performance for incinerators must be sent twice yearly to the appropriate authorities. Data on waste generation quantities must be collected recurrently (typically daily) from each area of a facility. Again, on-site segregation of the waste items into separate containers must be performed and each container weighed and compared against the number of patients or beds in use. Data on quantities of waste generated few days provide limited information and may not accurately reflect weekly or seasonal variations (MOH, 2006). Hence, for an accurate picture and better understanding of quantities of waste generated, data collection for a month or more with a repetition at different times in a year is advocated. In the absence of quantitative waste assessment, survey questionnaire asking staff to estimate waste quantities, or observations and interviews with staff could be used. When deducing data from measurements at distinct facilities consideration should be given to sampling size and the selection of illustrative facilities (Yuan, 2013). A host of factors affect waste generation and include but not restricted to: level of activity-measured in relation to number of occupied beds, patients per day; type of department- theatre, female ward, surgical ward or emergency ward; level of facility- polyclinic, hospital; Location, segregation practices, policies on waste classifications and level of infrastructure. Average waste generation rates are calculated in Kilograms (kg) per day or kg per year. For the comparison of different healthcare facilities with different levels of operations, kilograms per occupied bed per day or Kilogram per patient per day are used to estimate waste generation rates. In the absence of inpatient occupancy rates and daily number of out-patients, total number of beds can be used to estimate kilogram per bed per day. To

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analyse generation rates within a facility, the use of kg per person per month is suggested to be more accurate and a stable measure (Minoglou, Gerassmidou and Komilis, 2017; Moi et al., 2022; Vaccari, Tudor and Perteghella, 2018). To ensure proper waste generation records are kept, the DHMT and RHMT must monitor and supervise the compilation analysis of waste generation rates of facilities under their jurisdiction (MOH, 2006). As a result, different studies present percentage compositions in different ways. For example, whereas some studies simply present the percentage composition of one category, others divide the waste into groups and present the percentage compositions of those groups. Again, this makes it difficult to compare the outcomes. It has been proposed that emerging nations should have a uniform methodology to make it simpler to compare the findings (Diaz et al., 2008). However, the estimation of waste generation rates in the Ho Municipal is not an objective of this study. According to different sources including the World Health Organisation (WHO, 2013; 2005), healthcare waste is usually categorised into general waste such as decomposable wastes and waste that require special care such as sharps, anatomical waste, second waste from pharmaceuticals, blood and body fluids and third- infectious and radioactive wastes (Delmonico et al., 2018; Thakur and Ramesh, 2019; Nemathaga et al., 2008; Oweis, Al-Widyan & Al-Limoon, 2005). Waste generation rate is also affected season, that is whether dry or wet season in view of the fact that, the number of patients could reduce or increase depending on the season (Shinee et al., 2008; Hadipour et al., 2013). This makes comparison of findings from various studies very difficult and challenging. Similarly, socioeconomic status of patients at a particular hospital can also influence generations rates, as wealthy communities are noted to commonly generate more waste than poor areas (Pruss et al., 1999; Al-Khatib et al., 2009). Additionally, different studies have different definitions of different waste types

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(Komilis, 2016; Caniato et al., 2015). There is a growing concern about the effects of healthcare waste on public especially infectious waste, such as waste containing radioactive properties in the form of gas, liquid or solid contaminated with radio nuclide (Rahman, Ibrahium and Hung, 2011; WHO, 2005). In Ghana, healthcare waste is classified into general waste and hazardous waste. General waste is referred to as waste not soiled with blood, body fluids or other harmful materials and includes, paper glass, fabric and food residues. The second type of healthcare waste is regarded as hazardous waste due to their potential of producing various health risks due to their actual organic, chemical or radioactive contents (MOH, 2006). The categorisation of healthcare waste could be based on quantity, bulk density composition, colour coding and heating value According to the WHO, 2016). The Wold Health Organisation further recommends the categorisation of healthcare waste on the basis of material content and classification such as sharps (WHO, 2013). Similarly, literature reports that based on energy recovery practices, healthcare waste can be categorised by quantity, heating value and composition (Khan, Cheng and Khan, 2019). It is contended that the improper segregation of healthcare waste during generation, becomes increasingly difficult to handle due to contamination. Diaz et al., further contend that, the proper categorisation of waste prevents accidents and exposure to waste (Diaz et al., 2008) and offers knowledge on amount heating required in the process of energy recovery (Bujak, 2010). In areas where poor healthcare waste management practices occur, both health personnel and their clients are exposed to infectious waste which could create secondary infections owing to blood-borne pathogens (Anozie, Lawani and Mamah, 2017; Caniato, Tudor and Vaccari, 2015; Pruss et al 1999). Consequently, some unhealthy practices that could be sources of health risks are dumping of untreated waste into pits or open garbage bins are noted to be occurring in developing countries

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(Egbenyah et al., 2017; Abah and Ohimain, 2011) The inappropriate handling and disposal of healthcare waste can pose grave health risk to the producers, collectors, disposal sites personnel, and the community at large. The effective management of healthcare waste is also affected by the length of waste management process employed, and this varies between studies. Accordingly, some measurements take a month (Stankovic et al., 2008; Mohee, 2005), six months (Veiga, 2003); three days (Phengxay et al., 2005; Al-Khatib et al., 2009), seven days (Deneke et al., 2011; Shinee et al., 2008; Yong et al., 2009), while Idowu et al., used 15 days in the estimation of the quantities of waste (Idowu et al., 2013). Though the various studies have estimated waste quantities, it must be noted that, methods used to calculate the weights of waste differ. Thus, while in some studies the investigators weighed the waste bins to determine the rates (Patwary et al., 2009; Oduro-Kwartend, Addai and Essandoh, 2021), others relied on questionnaire that asked personnel to estimate quantities (DaSilva et al., 2005).

2.3 Management of healthcare waste

Healthcare waste management deals with all activities that lead to the safe and proper management and disposal of waste as well as all processes that ensure proper hygiene in healthcare facilities. So, for Ghana and the Ho Municipal, healthcare waste management must follow technical guidelines stipulated in the MOH policy guidelines on healthcare waste management. To ensure the proper management of healthcare waste all processes and procedure regarding the healthcare waste must be duly followed (MOH, 2006). Studies have examined the peculiar nature of healthcare waste management practices in designated health facilities (Manzoor and Sharma, 2019; Addo, Adei and Acheampong, 2019; Coker et al., 2009). Similarly, it is contended that, fruitful healthcare waste management epitomises a challenge in countries such as

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Ghana, Jordan, Nigeria and Bangladesh due to inadequate fiscal investment, non-existence of awareness creation and effective control, absence of qualified medical personnel in waste management (Patwary et al.,2009). Additionally, the lack of healthcare waste management rules and legislation at national level and the unavailability of suitable treatment and disposal alternatives further thwart management efforts (Ali, Wang and Chaudhry, 2017; Chishlom, et al., 2021). The tracking healthcare waste especially hazardous waste stream in most African countries is difficult because healthcare personnel are not aware of waste generation records (David, 2011; Ogbonna, 2013). Another survey in Nigeria found minimal application of healthcare waste management practices (Olukanni et al., 2014), while other studies have reported a non-segregation of waste at the point of generation and non-disinfection of infectious waste before disposal and incineration as the only method of waste treatment (Adu et al., 2020; Hasan and Rahaman, 2018). Similarly, issues of negligence and attitudinal problems, poor knowledge in safety protocols of waste management have been noted. These will account for lapses in the management of healthcare waste. Thus, the provision of improved waste management facilities and adherence to national regulatory frameworks will ensure reduced risk to public health (Debalkie and Kumie, 2017). It was also realised that issues of colour coding for infectious waste was erratic in the facilities (Adu et al., 2020). Through inclusive analysis of HCWM practices, it was found that, the system of waste management not to be efficient. Incineration was also found to be the only method of waste treatment. The study again revealed that majority of personnel did not practice the use of appropriate PPEs. This is noted to be source of injuries and disease transmission (Pruss et al., 1999). These issues call for the formulation of suitable laws and guidelines for all stages of waste management system. On the part of waste segregation as a management practice, studies have acknowledged

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disparities in the practice such as non-usage of colour-coded bags and bins and the storage of waste before disposal despite definitive laws and guidelines (Adu et al., 2020; Ogbonna et al., 2012). For example, in Limpopo it was established that some hospitals did not segregate contagious waste from general waste (Nemathaga et al., 2008). This, has been noted to be underpinned by ignorance on the part of waste workers who thought the practice of disposing infectious and general waste together as a normal practice (Al- Elmad, 2011). This, thus accounts for segregation problems in most health facilities especially in developing countries. Nonetheless, in the quest to ensure waste is effectively managed, the MOH guidelines strongly advocates for waste segregation. A practice which this current study also seeks to look into in the study area to find out whether it is in conformity with national guidelines of waste management practices. Similarly, on the disposal of liquid from health facilities in Yemen, it was stated that that most healthcare facilities disposed of liquid waste into sewerage systems without processing representing 20% and 50% for government and private hospitals respectively (Al Emad, 2011). Liquid waste from health activities is regarded as infectious and so for that matter their disposal into sewerage systems without processing or treatment may account or disease transmission. Moreover, an experimental research to investigate the management of clinical liquid waste in three Ghanaian healthcare facilities found disparate practices in clinical liquid waste management. Considering this in the context of the MOH guidelines, clinical liquid management falls short of stipulated practice as it affects treatment quality. I herein deduce that the ineptitude in the treatment is due to the lack of policy enforcement, unreliable power supply, ineffective monitoring by mandated institutions and lack of maintenance. Correspondingly, it was observed in Cameroun that; the supply and availability of sharp boxes was irregular which affected the effectiveness of segregation

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(Manga et al., 2011), while in Egypt several hospitals were found not to follow WHO recommendations of sharps boxes being replaced when two-thirds full (El-Salam et al., 2010). Issues of negligence and attitudinal problems, poor knowledge in safe procedures about waste management were found, with suggestions on adherence to nation-wide regulatory frameworks to ensure reduced risk (Debalkie and Kumie, 2017). Thus, inappropriate waste management practices, must be addressed through the establishment of assimilated programs which combine all aspects of waste management processes with a long-term objective of developing a cohesive waste management system whilst ensuring fiscal, technical and managerial capacity to manage and sustain it in various facilities at all levels.

2.4. Legislative and Regulatory Frameworks

Managing waste originating from healthcare activities is an essential component of healthcare scheme of a nation. Thus, an all-inclusive methodology to waste management must contain a clear delimitation of tasks, work-related healthiness and safety programs, waste minimization and segregation, the development and espousal of benign and environmentally all-encompassing technologies and capacity building (Wafula, 2019; Olaifa et al., 2018; Makhura, Matlala & Kekana., 2016; WHO, 2013). The urgency and enormity of this problem calls for nations to take initial steps in responding to this need, including the institution of regulatory outlines, development of nation-wide plans, and the establishment of innovative methods. For example, an almost non-existent of institutional arrangements on the management of healthcare waste have been noted in Nigeria (Coker et al., 1998; Olubukola, 2011). Similar study reported the absence of no waste management manuals in the facility studied. It was further revealed that, even though facility administrators were of the view that they

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supervised the activities of waste workers, actual field observations showed otherwise (Akum, 2014). Whether this phenomenon cuts across facilities in the study area or otherwise would be revealed by findings of this current study. However, the study did not touch on health personnel's perceptions on the potential risks associated with healthcare waste which this current study also seeks to investigate. Little attention being paid to the management of healthcare waste has also brought lapses in management as health concerns compete with limited resources (Abah and Ohimain, 2011). Thus, it is crucial for essential and sufficient information on the healthcare waste management practices and its health implications.

In Ghana, before the institution of the guidelines on healthcare waste management by the Ministry of Health, there was no sector-wide policy on healthcare waste management, with the result that each healthcare facility devised its own techniques and schemes of waste management, some of which ineffective (MOH, 2006). Further, there is no effective and laid down monitoring mechanism to verify compliance with agreed norms with regards to waste management in healthcare facilities throughout Ghana. Waste from health institution and its management constitute a multi-sectorial effort with the MLGRD and the EPA playing vital roles as implementer and regulator correspondingly. However, this duty is carried out through MMDAs which supervised by MLGRD and the EPA and National Sanitation Policy of 1999. However, Provisions in these Acts lacks specific provisions on the management of healthcare waste. For the National Sanitation Policy institutional procedures are needed for waste collection whilst to the Buildings Regulation, domestic refuse and hazardous waste should be treated individually without specific guidelines on how this should be carried out. As indicated by the MOH, this scenario allows for the performance of functions to fall through the cracks. Beneath are some laws that have significance for its management:

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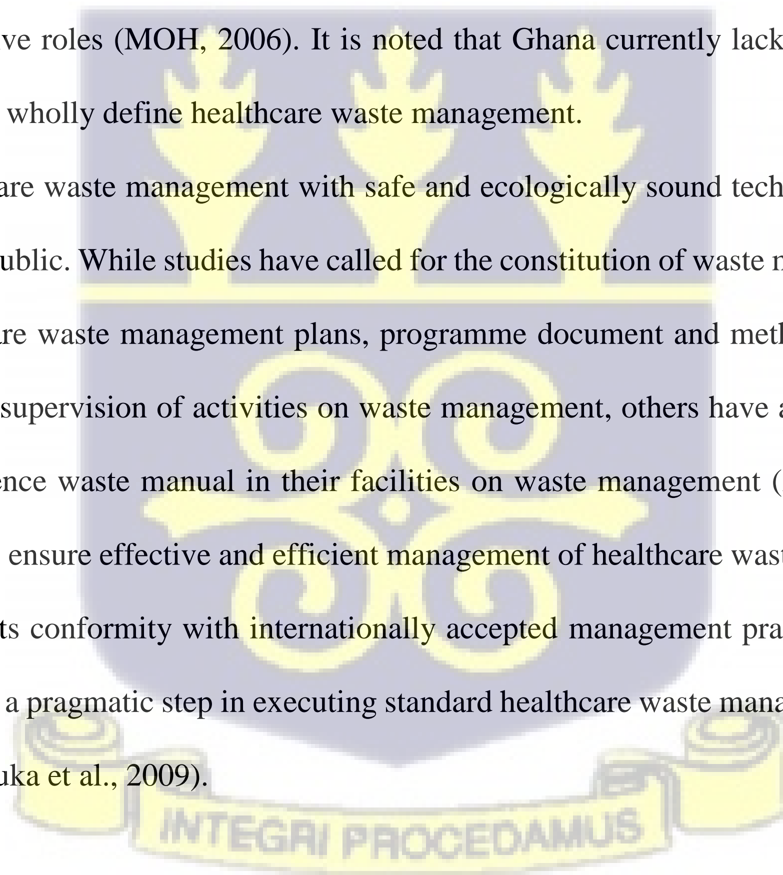
1992 Constitution of Ghana, EPA Act, 1994 (Act 490), Environment Assessment Regulation 1999, Local Government Act, 1993 (Act 462), Town and Country Planning Ordinance, 1944 (Cap 84), Food and Drugs Law 305b (1992), Vaccination Ordinance Cap 76, The criminal Code, 1960 (Act 29), Infectious Diseases Ordinance, Mortuaries and Funerals Facilities Act, 1998 (563), (MOH, 2006). With regards to the proper disposal of waste, the ultimate responsibility lies with the health facility involved in the production of the waste which is in line with polluter pays legal framework. Consequently, as healthcare facilities generate waste, they are therefore responsible for its management by ensuring pragmatic steps are taken with regards to segregation, treatment, storage and disposal where pertinent stakeholders and agencies play supportive roles (MOH, 2006). It is noted that Ghana currently lacks a specific legal law that wholly define healthcare waste management.

Healthcare waste management with safe and ecologically sound techniques lessen the risk to public. While studies have called for the constitution of waste management team to prepare waste management plans, programme document and methodical strategies and the supervision of activities on waste management, others have actually observed the absence waste manual in their facilities on waste management (Al-Amad, 2014). Thus, to ensure effective and efficient management of healthcare waste, it is prudent to ensure its conformity with internationally accepted management practices which will serve as a pragmatic step in executing standard healthcare waste management practices (Ngwuluka et al., 2009).



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2.5. Education and Training

The need for knowledge, attitude and skill base training of stakeholders in the management process of healthcare waste is vital (Pruss et al., 1999, WHO, 2014). Thus, capacity building of healthcare personnel is fundamentally a way to lessen the transmission of secondary infection to both healthcare staff and the public (WHO, 2014). Several studies on healthcare waste management has either reported the lack of or inadequate training for healthcare personnel and waste handlers in facilities especially in developing countries (Govender, Olaifa and Ross, 2018; USAID, 2009). The training of healthcare personnel produces more knowledgeable personnel which serves as the basis for attaining higher standards of infection control (Anozie, Lawani and Mamah, 2017; Wafula, Misiime and Oporia, 2019; Guerrero et al., 2013; WHO, 2014). Similarly, the ICRC reiterates the essentiality for personnel of health facilities to be trained regardless of methods in order to ensure all procedures in the waste management chain are exclusively complied with (ICRC, 2011). A review of healthcare waste management practices found that the unnecessary classification of healthcare wastes as infectious accounts for higher cost of disposal with augmented environmental effects (Windfeld and Brooks, 2015). It was established that there was the need for better education of healthcare professionals was needed to ensure an improved and efficient waste management practices in various healthcare facilities (Mmereki, et al., 2017).

Training of healthcare personnel prevents work-related exposures to risks concomitant with waste emanating from their activities (Levy and Roelofs, 2019). In addition, the essence of ecological protection is equally heightened if more people are equipped with the needed skills in the management of healthcare waste; thus, aiding them in changing attitudes that might put them at risk (Houghton et al., 2020). Others scholars argue that,

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training and continuous education are fundamental to healthcare waste management system (Guerrero et al., 2013; Mmereki et al., 2017; Khan et al., 2019). It is against this milieu that the WHO also calls for the institutionalisation of training of healthcare personnel as a standard function of all healthcare facilities (WHO, 2005, 2014). In the same vain the Ministry of Health-Ghana, charges all healthcare facilities to ensure training of waste handlers and other professionals (MOH, 2006). The need to ensue advanced training of all personnel is important. To this end, Ghana have made strides in the training of healthcare personnel in the management of healthcare waste. This need has been anchored by the WHO and other scholars by advocating for the inclusion of all employees in any training targeted at effective healthcare waste management, and must communicate the benefits to all (Dang, Dang and Tran, 2021; WHO, 2013; Guerrero et al., 2013). In view of this, training programmes must be intended for the varied categories of employees and must be in the form of workshops, pre-service and in-service training (WHO, 2014; MOH, 2006). In Support of this is an observation made in Nigeria where skilled waste personnel were used whilst the use of qualified personnel was absent in medium and small-scale healthcare facilities. In general, the study depicted inadequate appropriate training for waste handlers on waste disposal practices (Ogbonna et al., 2012). Contrary to this assertion, in Ghana, health personnel said they had received some training on the healthcare waste management but indicated the duration of training was limited between one to three days. It was also stated that training on healthcare waste management was not given much prominence (Odonkor and Mahami, 2020; Oduro-Kwarteng, Addai and Essandoh, 2021; Akum, 2014). In India lack of in-service training for the majority of health personnel on HCWM have been reported where only 17 percent specified to have received some training (Nagaraju et al., 2013). Similarly, it was revealed in a study in Egypt that training programmes on

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healthcare waste management were limited for doctors, nurses and technicians whilst about 50 percent of the facilities surveyed provided some sought of training to supporting staff such as cleaners and waste officers (El Salam, 2010). Likewise, in India the study of biomedical waste in Haryana to understand the level of awareness relative to management of healthcare waste, advocated for continuous training programs for all levels of health of health personnel with special focus on housekeepers (Puneet et al., 2016). Besides, research in Yemen indicated that, though majority of hospitals administrators were of the view that training was being given to waste workers and other staff on the management of healthcare, actual interviews conducted with waste workers proved contrary to the assertion. It further revealed that private hospitals did not see the need to have specially trained waste workers while only 20 percent of administrators in state-owned hospitals confirmed the significance of having specialised waste workers (Al Emad, 2011). Training can therefore be said to be related to healthcare quality improvements. Similarly, a review of healthcare waste management practices found unnecessary classification of healthcare wastes. It was established that there was the need for better education of healthcare professionals was needed to ensure an improved and efficient waste management practices in various healthcare facilities (Windfeld and Brooks, 2015).

2.6. Minimisation of Healthcare Waste

The minimisation of healthcare waste, the risk allied with it and the reduction in pollutants are deemed a significant phase in the management process of healthcare waste and a sure way to reduce the cost allied with waste management and treatment (Chartier, 2014). An important step in achieving waste minimisation is to ensure a reduction in generation at the source of production, as well as the institution and

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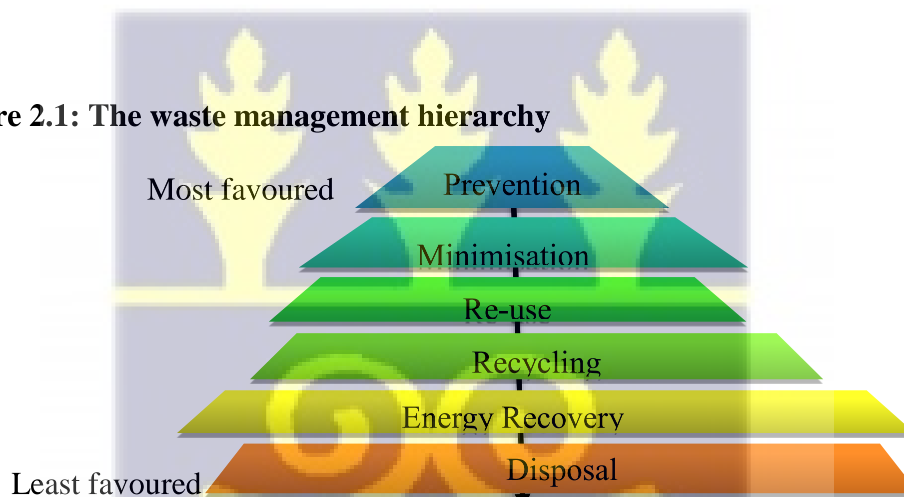
implementation of strict rules, good stock management practices and the application of the techniques of reuse and recycling (Abah and Ohimain, 2011). This leads to efficient management system and a sure way to boiling down cost allied with the disposal of healthcare waste (WHO, 2005). Correspondingly, it is argued that, good management practices and the reuse and recycling of equipment goes a long way to minimise the quantity of generated waste in facilities (Minoglou, Gerassimidou & Komilis, 2017; Chauhan & Singh, 2016; Lee et al., 2002). However, materials to be reused and recycled should be restricted due to infection and contamination. The need to protect public well-being through management of healthcare waste can be attained through waste minimisation by applying the concept of the 3Rs as depicted in Figure 2.1.

Figure 2.1: The waste management hierarchy



Source: Guerrero et al., (2013)

The waste hierarchy is based on the principle of desirability-which deals with the aggregate advantage of each technique owing to their specific effects on the environment and the public, fiscal affordability and social suitability. Thus, the best practice in waste hierarchy deals with the avoidance or recovery of much of the waste as possible within the healthcare facility. The most desirable method is to elude the production of the waste as far as possible. According to the WHO healthcare waste

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minimisation should be part of the waste management strategy of health facilities with an all-inclusive aim of moving current practices upwards in the ladder from mainly disposal to emphasis on recycling and prevention. Consequently, for waste minimization, a breakdown of the amounts of recyclable materials is needed. The education of healthcare personnel on the use of medical equipment cautiously to evade generating needless waste is a further simple measure that can be employed. Another waste minimisation technique to consider is reuse which entails realistically assessing which reuse practice is considered safe. This is because of the potential risk of infection transmission to patients and staff.

2.7. Handling and Segregation of Healthcare Waste

Handling of healthcare waste can be a major source of occupational injuries or safety. The inappropriate handling of healthcare waste especially infectious waste may pose all sorts of danger to health professionals and the general public. According to Pruss et al., the safe and proper handling of healthcare waste is an important cog in the mitigation of adverse effects among frontline line staff of health facilities (Pruss et al., 1999), while the unsafe handling of healthcare waste is most prospective in causing harms such as blood borne pathogens to people that come into contact with waste (Soliman and Ahmed, 2007). Besides, calls have been made for the strict adherence of wearing protective equipment such as mask, goggles and gloves while handling healthcare waste (Pruss et al., 2013). Consequently, the practice of wearing protective equipment in the handling of waste have been observed in large hospitals in Port Harcourt compared to medium and smaller ones. The study further indicated the use of protective equipment in order of magnitude from gloves, to jackets and safety boots in large hospitals while the use of protective equipment in medium and small facilities

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decreased order of overall jackets, gloves and safety boots (Ogbonna et al., 2012). Segregation is one sure way of ensuring the protection of public health. Waste segregation must be done as close as possible to the point of generation (Guerrero et al., 2013). A 'three-bin system for the segregation of healthcare waste is encouraged to be practiced in all countries (Guerrero et al., 2013). This will ensure the separation of waste into general, sharps and infectious wastes thereby providing minimal level of exposure and safety to personnel and patients. Additionally, a vital factor to ensuring minimisation and effective management of healthcare waste is identification and segregation of the waste (Chauhan and Singh, 2016; Rao et al., 2004; Hasmori et al., 2020). In a recommendation they stated that, the most fitting method of identifying various classes of waste is sorting the waste into well labelled colour-coded containers or plastic bags especially for infectious waste (WHO, 2005; Pruss et al., 2011; MOH, 2006). For waste segregation to work effectively, staff of healthcare facilities ought to be provided with colour-coded receptacles and sack holders (MOH, 2006). For effective and efficient use of these containers, they should be placed in locations near to the point of generation of waste as possible and supplanted when three-quarters full, tightly fastened and correctly labelled (MOH, 2006). As different waste types are produced in healthcare facilities, there is the need for different methods of handling, treatment and disposal. It is therefore essential for waste to be separated into distinct different types for the sake of safety, and to facilitate minimisation and the application of the suitable treatment and disposal methods (MOH, 2011). For waste segregation to be effective, instruction procedures regarding waste segregation ought to be posted at defined locations where waste segregation occurs as well as other vantage points. A study in Nigeria showed waste segregation in some healthcare facilities were absent and that all waste types were disposed in the same waste receptacles. It was emphasised that the

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near absence of waste data and minimisation policies, inappropriate waste segregation practices and non-existence of informative posters on segregation and disposal of waste affects total waste handling (Olubukola, 2009). However, studies have revealed the absence of colour-coded bins for segregation and storage of various streams of waste generated before disposal (Ogbonna et al., 2012; Akum, 2014). It can therefore be said that the failure to segregate waste would make the management of healthcare waste needlessly a very expensive venture.

2.8. Storage of Healthcare Waste

To ensure the mitigation of risks and injuries, as well as diseases that ensue from the disposal and storage of healthcare waste, proper storage of healthcare waste is a significant step in the safe and secure way to protect healthcare professionals and the public from the harm that these wastes could cause. Hence the provision of waste storage facilities would be a useful step in storage process. Storage of healthcare waste has to do with how waste is containerised during the time elapsed between its production and assortment for final disposal (MOH, 2006). In Ghana and according to the MOH, the storage of healthcare waste is must done both internally and externally. Storage must be determined by the sort of waste being handle and the likely risks of infection that it might pose to healthcare personnel and waste disposal staff (MOH, 2006). Storage of healthcare waste is either on-site or off-site.

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2.9. Collection and the Transportation of Healthcare Waste

Regular collection and transportation of healthcare waste from the points of generation to both internal and external storage sites is an essential part of waste management process (EPA Act 1990). Trucks used in the conveyance of healthcare waste must be

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cleaned and disinfected regularly in order to minimise infection and contamination (MOH, 2006; Pruss et al., 1999). On-site transportation of waste should usually take place during less busy hours whenever possible with set routes for onsite transport in order to avert exposure to employees and patients (WHO, 2011). To ensure this, the internal transport of waste should use separate routes and floors subject to the design of the health facility. A survey by Manyele in Tanzania observed the absence of waste transportation system because none of the facilities studied had a treatment unit. The study further revealed the absence of vehicles for off-site transportation of waste in Kinondoni whilst only 6% of facilities had vehicles for off-site transportation. This situation will lead to the treatment of waste in areas not engineered for such purposes which can be a source public risk (Manyele & Lyasenga, 2010).

2.10. Treatment and Disposal Methods of Healthcare Waste

The treatment of some particular types of healthcare waste is a way of ensuring staff, patient and public safety (WHO, 2011). According to the world body, the treatment of healthcare waste should be looked at in relation to the waste management hierarchy. In relation to GHS guidelines, treatment options are available to healthcare facilities across the country and at the various levels of health delivery. Through a review of healthcare waste management practices found that the unnecessary classification of healthcare wastes as infectious accounts for higher cost of disposal with augmented environmental effects (Windfeld and Brooks, 2015). It was established that there was the need for better education of healthcare professionals was needed to ensure an improved and efficient waste management practices in various healthcare facilities.

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2.11. Risk Associated with Healthcare Waste

Health effects could be perceived or real. Of concern to the public, health authorities, media and civil groups is the regulation of waste management processes and their subsequent outcomes. A number of epidemiological research reports have linked a variety of ill-health outcomes to waste management processes. Childhood and liver cancers, birth anomalies and are said to be associated with incinerators and landfill facilities (WHO, 2005; Pruss et al., 1999). Healthcare waste may pose very greater threats than original diseases themselves if not properly managed despite healthcare facilities core mandate of safeguarding the health of communities (PATH, 2009).

2.11.1. Public Health Risk

Waste from the activities of health and medical research centres has the potential of being hazardous to human health if left unregulated. Accordingly, safeguarding the health of patients, health professionals and the public at large is essential as they are affected by poor management of healthcare waste (Shinee et al., 2008). Consequently, serious health problems can arise due to the exposure of people to healthcare waste especially hazardous or infectious waste from healthcare activities through direct contact or indirectly (Shinee et al., 2008). Healthcare waste possess cancer-causing characteristics and is thus recurrently concomitant with diseases of the reproductive nervous and respiratory systems of the human (Mato & Kaseva, 1999; Rushton, 2003). Healthcare personnel are said to be at risk from communicable diseases due to their exposure to infectious waste such as needles and other sharp instruments in the performance of their professional obligations (Alagoz & Kocasoy, 2008). Likewise, solid healthcare waste poses a higher risk not only to handlers of waste but to communities if disposed in areas where waste is improperly managed and thus easily

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accessed by the public, particularly children (WHO, 2005; Mbongwe et al., 2008). All these have led to the call that a waste management strategy must be all-inclusive, comprising all facets of generation, collection, transportation, treatment and final disposal (Cheng et al., 2009). This has brought about calls for a healthcare waste management strategy to originate from national law underpinned fiscal resource allocation, methodical support and the training of personnel in best practices (DenBos and Izadpanah, 2002; Soliman and Ahmed, 2007; Tudor, 2007). Yet, it is stated that while sharps are generated in minute quantities, they are extremely contagious (WHO, 2005; Pruss et al., 1999). Besides sharps represent binary risk because they do not only cause cuts and punctures but also infect injuries when contaminated with disease causing agents. Accordingly, sharps have been reported to cause pervasive injuries among healthcare personnel in Tanzania (Mato and Kaseva, 1997). Similarly, a study reported 20 percent of people who handle waste encounter 'stick' injuries (Chandra & Shishoo, 2001). In Africa, healthcare related infections may be a contributing factor for the spread of HIV (Gisselquist et al., 2003) and apart from causing infections, sharps may accidentally cause inoculation regardless of whether they are infected (Tamplin et al., 2005). Sharps are therefore considered as very perilous wastes that cause the transmission of HIV and hepatitis B and C through injuries from syringes contaminated by human blood. The mismanagement of healthcare waste is said to be a source of diseases such as diarrhoea, typhoid, leptospirosis, cholera, HIV and hepatitis B (Mato and Kasenga, 1997). Healthcare personnel and waste workers are said to be with the most risk of infection or injury (WHO, 2015).

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Figure 2.2: PERSONS AT RISK FROM INFECTIOUS HEALTHCARE WASTE

2.12 Risk Perception

Perception with regards to any risk might differ depending on the kind of risk, its context and the personality of individual. Risks in the natural sciences differ from the way social scientists perceive risk. To the natural scientist, risk is the possibility of an adverse effect. The daily use of the word risk has different meanings (Renn, 2008). Thus, in most social context, risk refers to the possibility of an adverse effect ensuing from an event. The knowledge, attitudes, feelings, values and experiences play important roles in seriousness and acceptability of a risk. As stated by Slovic (1987), the term risk perception in the social sciences has become an orthodox standard. However, mental prototypes and other mental mechanisms used by people to evaluate risk, include intellectual heuristics through which images of risk are internalised through societal and cultural factors and repetitively moderated through media, peer influences and other communication procedures (Morgan et al., 2001).

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2.13 Studies on Knowledge, Attitude and Practice

The use of Knowledge, Attitude and Practice (KAP) studies was initially explored in family planning and population studies fields in the 1950s and have been used to examine health behaviours (Launiala, 2009). Other scholars have acknowledged the use of these surveys in needs assessment to determine the knowledge, attitudes and practices of a population and have been equally employed in offering policy strategies of specific programmes as well as providing the complete state of issues or programmes they are designed for (Malele-Kolisa, 2009). They again serve as educational analysis and inform us of what people know in relation to particular things, feelings and behaviours towards them (Kaliyaperumal, 2004). Moreover, KAP studies are amongst deep-rooted approaches that examine health behaviour and are extensively used to gather information for the planning of public health programmes. Similarly, studies that incorporate the knowledge, attitudes and practice analysis of a particular population serve as illustrative research to gather information on what is known, believed and done in relation to that population or a specific topic. It thus, amasses information about what respondents know, think and actually do with regard to seeking care or taking other actions related to the topic. Usually, data from KAP surveys are collected through interviews or structured questionnaire. The data then is analysed qualitatively or quantitatively subject to the aims and objectives and design of the study. Data from KAP surveys are vital in planning, implementation and evaluation and policy formulation. These surveys can identify knowledge gaps, cultural beliefs, or behavioural patterns that may facilitate understanding and action. They help to ascertain information that is usually well-known and attitudes normally held. To some extent, these sought of surveys can categorise factors influencing known behaviour to majority of people, reasons for such attitudes and why they practice certain behaviours. They

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can also be used to evaluate communication methods and sources crucial to defining effective activities and messages in injuries prevention and control related to healthcare waste management. Various techniques are employed in KAP studies to stimulate better responses and to identify respondents' behaviour, knowledge, attitudes, perceptions, motivations, feelings and fears. These include word associations and indirect probing.

The focal drive of this study was to explore the Knowledge, Attitude and Practices of medical personnel, and paramedical personnel on healthcare waste management. To carry out this type of survey, it is important to establish a basic premise and provide definitions for each word. Globally several studies have been conducted on the knowledge, attitude practice in understanding the management of healthcare waste. About knowledge and practice in healthcare waste management, studies have established lack of knowledge on awareness of health waste management and this led to poor practices in waste handling and management. The study however focused on both knowledge and practice without a focus on attitudes (Nagaraju et al., 2013). Similarly, Sehgal et al. (2015) assessed the knowledge of health personnel and established that awareness of the accurate meaning of HCW among healthcare personnel was found to be higher 54.2% which comparatively was maximum within laboratory staff (86.7%) and the minimum within sanitary staff (0%). On the awareness of the exact legislative act on HCWM rules, this was shown to be poor. While most respondents were aware of the existence of some legislation connected to HCW management, they could not state the specific law (Sehgal et al., 2015). Consequently, the awareness on the spread of important diseases such as HIV infection and hepatitis B was high amongst qualified health personnel such as doctors, nurses and laboratory staffs, and low among sanitary staffs. In resonance to the preceding is a study in Pakistan where knowledge on infectious waste management was higher in doctors and

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nurses as compared to sanitary workers and other paramedics. This loop-hole was stated to stem from educational level, work experience and training as well as practical involvement in waste management. Practices on the management of infectious waste was found to be poor due to deficiency in application of proper colour coding system (Kumar et al., 2013). In line with the above is the fact that majority of HCWs were aware of waste management rules whilst only 10% were aware of the regulating authority in another study in India. It also came to light that knowledge on needle stick injuries was high amongst workers as well as awareness of the consequences of needle stick injuries (Ravishekar et al., 2016). Correspondingly the outcome of another study concluded that there was lack of knowledge on the awareness on health waste management and this led to poor practices in waste handling and management (Nagaraju et al., 2013). In Bangladesh analysis discovered a poor system of healthcare waste management among senior staff in a college hospital. This was because personnel did not have much knowledge on healthcare waste management system and practices. It was further exposed that majority of the respondents had no idea on the correct colour coding system used. It also came to light that both the human resource and the necessary equipment for the effective management of healthcare waste were not enough (Uddin et al., 2014). Similarly, it was observed through a KAP study in Pakistan that younger health workers had better knowledge in healthcare waste management than other workers. It was found that socio-demographic characteristics of affect the knowledge, attitudes and practices amongst various categories of healthcare personnel. The study suggested the need for continuous education to improve the knowledge, attitudes practices relative healthcare waste management (Kumar et al., 2018). Likewise, a KAP study in Egypt on the management of HCW showed that knowledge of proper colour coding, proper disposal of sharps and

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biohazard symbol identification was higher in physicians than nurses and housekeepers. On attitude, a greater proportion of doctors who concerted that safe disposal was important in the stoppage of infections. Majority of surgeons agreed that the use of PPE decreases risk of contracting infections housekeepers and nurses. The study revealed that, more housekeepers knew about facility and departmental waste disposal plans than nurses; whilst the proportion of housekeepers who concerted that disposal of the waste is a team duty was higher, than in nurses and doctors. Overall nurses were said to practice correctly the disposal of blood-stained fomites and general waste correctly than physicians (Akkajit, Romin and Assawadithalerd, 2020).

In ascertaining gaps in healthcare knowledge, attitude, and practice among health personnel, it was established that safety issues in healthcare waste management has not been part of the curricula for training healthcare personnel but had on the job training which enhanced the workers' compliance to hepatitis B immunisations and use of personal protective equipment when handling healthcare waste (Nkonge et al., 2012). A similar survey in Nigeria revealed a significant variation in the management of healthcare waste management practices in the facilities studied, as well as sustainability principles of reduce, reuse and recycling of healthcare waste. It was revealed that the main method of waste disposal was through incineration. The study therefore advocated for other improved and newer methods of waste disposal (Anozie et al., 2017). A cross sectional KAP survey to assess waste managing practices of a regional health facility in the greater Accra region of Ghana with regards to compliance of provision made in the MOH guidelines of 2006 by the regional hospital; It was found from this study that majority at the facility have had training on the healthcare waste management and this formed about 60%. It was also revealed that a greater proportion of the healthcare

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personnel in that hospital were aware of MOH policy guidelines on the management of HCW in Ghana (Acheampong et al., 2016).

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2.15 Healthcare waste management in Ghana

This section considers the management of healthcare waste in Ghana with reference to the MOH guidelines on the effective management of healthcare waste. It amongst other things looked at the various issues regarding healthcare waste management as stipulated by some acts and the MOH guidelines of 2006; and how this has fit into this study and has been in the study area on healthcare waste handling, segregation, treatment and final disposal, Healthcare waste categorisation, segregation and containment, colour coding, storage, general requirements for waste collection containers, collection and transportation, waste treatment, capacity building, information and education, implementation and monitoring and review are among the themes to be addressed.

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Waste management in Ghana constitute a multi-sectorial effort with the Ministry of Local Government and the Environmental Protection Agency playing key roles as implementer and regulator respectively. However, this duty is discharged through MMDAs under the supervision of MLGRD on one hand and on the Environmental Protection Agency on the other. With regards to the proper disposal of waste, the ultimate responsibility lies with the health facility involved in the production of the waste which is in line with polluter pays principle or legal framework. Accordingly, as healthcare facilities generate waste, they are responsible for its management by taking pragmatic steps to ensure their separation, storage, treatment and safe disposal with the support of the pertinent stakeholder ministries and agencies (MOH, 2006). According to the MOH and relative to the institution of the healthcare waste management guidelines, Ghana currently lacks a specific legal law that addresses the management of healthcare waste. However, Existing laws and policies delegate certain responsibilities to state institutions including the district assemblies and the EPA through the EPA Act 490 of 1994 and National Sanitation Policy of 1999; but the provisions in these Acts lacks specific provisions with regards to the management of healthcare waste comprehensively. For instance, the National Policy calls for the institutional measures for collection of waste while the Buildings Regulation mentions that domestic refuse and hazardous waste shall be treated separately without stating how. As indicated by the MOH, this situation, leaves room for the performance of functions to fall through the cracks regarding the effective and efficient management of healthcare waste. As a matter of concern and to ensure the protection of healthcare personnel, the public and environment from potential risk that may be attributable to improper waste management, hence the guidelines. Beneath are some laws that have relevance for the management of healthcare waste in Ghana: The 1992 Constitution of

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the Republic of Ghana, EPA Act, 1994 (Act 490), Environmental Assessment Regulation 1999 (LI 1652), Local Government Act, 1993 (Act 462), National Building Regulation, 1996 (LI 1630), Town and Country Planning Ordinance, 1944 (Cap 84), Food and Drugs Law 305b (1992), Vaccination Ordinance Cap 76, The criminal Code, 1960 (Act 29), Infectious Diseases Ordinance, Mortuaries and Funerals Facilities Act, 1998 (563), Quarantine Ordinance Cap 77 and the Mosquito Ordinance Cap 75 (MOH, 2006). All these acts do not have explicit methods for the management of healthcare waste in the study area and Ghana at large. Considering the enormity of the risk that healthcare waste could pose and the call by the WHO for all countries to have national strategies on the management of healthcare waste, the MOH being proactive and wanting to ensure the protection of its workers and the general public and the environment issued guidelines on the management of healthcare waste in Ghana. The institution of these guidelines implies that healthcare establishments are mandated to effectively manage waste produced in their facilities to acceptable standards or conformity to the guidelines. Based on these guidelines, healthcare waste in Ghana have been categorised into two namely hazardous waste and non-Hazardous waste. Hazardous waste is considered as healthcare waste that has the potential of causing harm or causing injury to a variety of persons including health professionals, patients and visitors to health facilities. The various categories of wastes are classified as A, B (subdivided into B1, B2, B3), C, D (subdivided into D1, D2, D3, D4, D5 and D6), E, and F. Table 4.7 below summarises the various categories of healthcare wastes and their content generated in healthcare facilities in Ghana according to the Ministry of Health guiding principles on healthcare waste management.

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Table 2.1. Classification of Healthcare waste in Ghana (MOH, 2006)

Type	Classification and Description	Content
A	**General/Normal Waste** Waste similar to domestic waste. Regarded as harmless except produced within healthcare facilities and requires special handling.	Paper, cardboard, ash, plastic materials, kitchen waste, sawdust, pieces of wood, sweepings from lawns, corridors, offices, workshops, stores etc
B	**Infectious Waste-** Wastes having physical and chemical characteristics similar to industrial hazardous waste- produced by both in-patients and out-patients. Contain pathogenic micro-organisms. Requires special management.	Laboratory waste produced as a result of microbiological investigation. Potentially infected blood and human and animal tissue (e.g HIV)
B1	**Sharps-** Sharp-edged wastes with puncture and or cutting properties posing risk of injury and infection. May be stained or polluted with blood or body fluids from injection or surgical equipment etc.	Needles, syringes, surgical blades, scalpels, test tubes, ampoules, glass instruments, pipettes etc.
B2	**Patient Waste/Culture/Specimen** Wastes produced from out-patient activities and may be contaminated with blood or body fluids from surgical operations, injection rooms (other than sharps) etc. also include clinical specimen, laboratory culture and human tissue.	Soiled material (e.g stained cotton, wool, used bandages dressings, gloves, linen, blood transfusion bags, urine, faeces Culture plus specimen (e.g experimental, specimen (animals), tissue culture, urine, stool) Urine, faeces (stool) from laboratory
B3	**Pathological/Organic, Human/Animal Tissue** This waste type includes amputations and other body tissue resulting from surgical operations, autopsy, and birth and thus requires special treatment for ethical and aesthetic reasons	Internal body organs, amputated limbs, placentas, foetus Human liquid waste (e.g urine, blood products or blood) Effluents from mortuaries
C	**Pharmaceutical Waste** Waste generated from the pharmacy	Expired drugs (solid / liquid, plastic or glass containers. Chemotherapy residue- cytotoxic, genetoxic or carcinogenic
D	**Chemical Waste-** Consist of spent chemicals from research, laboratories, and pharmaceutical companies	Acid, Alkalis, organic substances, solvents, and heavy metals
E	**Radioactive Waste** Solid, liquid or pathological waste contaminated with radioactive isotopes of any kind	Solid-papers, gloves, cotton swabs, needles, Liquid-patient excreta, gastric content, Spent radiation sources. Technetium generators, Radium needles
F	**Incinerator Ash/Sludge/By-products of waste treatment** Waste generated from the combustion of hospital waste- to be disposed of in landfill site.	Incinerator fly ash and its residues Leachate etc.

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Just as category B waste have sub-categories, category D also have sub-groups which range from D1 (x-ray photographic film, Radiological Waste,); D2(Acids- Hcl, Oxalic acid); D3 (Alkalis Sodium, hydroxide); D4 (Volatile Solvents, Ethanol, Methanol, Xylene); D5 (Organic Substances, Chlorine tape); and D6 (Heavy Metals, Mercury). Thus, segregation of healthcare waste must be done according to this categorisation in terms of containment using the appropriate colour coding as indicated in the MOH guidelines on healthcare wastes management. The designated colour coding system for the segregation of healthcare waste is Black for general waste, Yellow for infectious waste and Brown for pharmaceutical waste.

2.15 Disposal and treatment options of healthcare wastes in Ghana

Appropriate healthcare management includes the methods of treatment and disposal of the waste (MOH, 2006). In reference to the MOH guiding principles on the management of healthcare waste in Ghana, the various categories of healthcare wastes have their treatment and disposal methods. This is depicted in the table below:

2.16 Operational Definitions

Per this study, Knowledge, Attitude and Practice were defined as indicated below:

2.16.1 Knowledge (K): refers to respondents' understanding of the topic. Hence knowledge information was assessed through the classification of waste, segregation procedures, biohazard symbol identification and collection and transportation of procedures.

2.16.1 Attitude (A): refers to the respondents' feelings towards healthcare waste management as well as any preconceived ideas that they may have regarding it. It serves as a midway variable between a situation and its response.

2.16.1 Practice (P): means in which personnel revealed their knowledge and attitudes.

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2.17 Theoretical and Conceptual frame work

Theoretical framework provides the necessary theory within which the study is situated upon which the problem, the research question, and the objectives set for the study can be given an epistemological origin. The research theory according to some scholars is the fundamental epitome of any social science research. This thinking is in line with that of Fewcett and Downs (1986) who view theory and research as interdependent variables. Scholars in the field of research have identified three core importance of theory in any social science research:

1. It situates together all the hypotheses or concepts related with the researcher's topic. The theory leads the way into specific questions to be asked in the work.

2. With theory, one is able to identify the start of a research and the problem by presenting the gaps and inconsistencies in the earlier works.

3. It presents the relationship among variables that have been investigated.

Two theories would be employed in understanding the study variables. These are the cultural theory and the theory of planned behaviour. Each of this theory explains different aspect of the problems or challenges identified about the management of healthcare waste and their relation to stipulated national guidelines on the management of healthcare waste in Ghana.

2.17.1 Cultural Theory

Cultural risk theory is concerned with collective, societal, and shared conventions that influence individual perceptions. Risk perception is a "culturally standardized reaction," according to cultural theory (Douglas, 1992). Cultural theory posits that people perceive risks in different forms or ways and this is typically characterised by their social or cultural make-ups. The cultural theory was propelled by Mary Douglas

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(1921-2007) and Douglas and Wildavsky (1982). According to (Dake, 1991; Wildavsky and Dake, 1990) cultural has been very significant in the debate on risk acuity and risk analyses. To Wildavsky and Dake (1990) cultural philosophy of risk has the capacity to "predict and explain what kind of people will perceive which potential hazards to be how dangerous". Safe and appropriate handling of healthcare wastes is indispensable to mitigating adverse health effects among frontline staff (Pruss et al., 1999). Precarious management of this waste most likely to cause complications such as blood borne pathogens specifically to healthcare personnel, scavengers and municipal waste workers (Soliman and Ahmed, 2007). Thus, I argue that, the cultural make of health personnel such as work experience, age and sex will influence their perception of risk.

Risk is a key factor in healthcare waste legislation and practice. The disposal of healthcare wastes could often be ineffectively supervised notwithstanding the publication of clear and absolute strategies and the outline of strict legislative control. Thus, regulations are a principal part of healthcare waste management processes. On the international stage, regulations that relate to the management of healthcare contaminants are enshrined in a number of frameworks including the Polluter-Pays-Principle (PPP), the Proximity Principle, the Precautionary Principle, and the Basel Convention. The proximity concept addresses the requirement to dispose of hazardous wastes close to the point of generation, whereas the PPP places legal and financial responsibility for disposing of hazardous pollutants on generators of such wastes. Due to the lack of scientific certainty, the precautionary principle requires adequate management action to limit the dangers posed by hazardous wastes. The Basel Convention, for its part, is concerned with cross-border migration of dangerous wastes such as hazardous healthcare waste. In spite of these global frameworks, different

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countries have their local frameworks to the handling and management of healthcare wastes. Hence, familiarity with the key types of healthcare waste set out in national or local guidelines on waste sorting must be of utmost importance to healthcare employees. An aspect of this research is to find the knowledge base of the infection control officers about regulations pertaining to waste management. Incompetence may lead to dire consequences by putting healthcare professionals as well as the public. Knowledge on the hazards associated with the management of healthcare waste is important to prevent the risks of mismanagement (Ananth, Prashanthini and Visvanathan, 2010).

In some cases, health personnel have been noted to receive sufficient information on the hazards and risks allied with unsafe handling of healthcare waste nor receive any form of training on how to eliminate, or reduce to minimum such hazards (Chartier, 2014; Hossain, Santhanam and Norulaini, 2011). So, inadequate guidelines on the personal protective equipment use and emergency procedures such as spillage can put them at great risks. This is because a number of them may be employed by external waste collection contractors instead of being employed directly by healthcare facilities; and may not have received any training or information on occupational risks to which they may be exposed and on the proper procedures in the handling of these waste. Another group that is poorly educated and may suffer from the risks of hazardous healthcare waste is scavengers who sought healthcare waste. They are often seen collecting waste in facilities grounds as well as waste sites and landfills. Hence, the need to have some sought of training for these categories of people who will come into contact with the waste through the handling of hazardous healthcare waste need some form of education or training.

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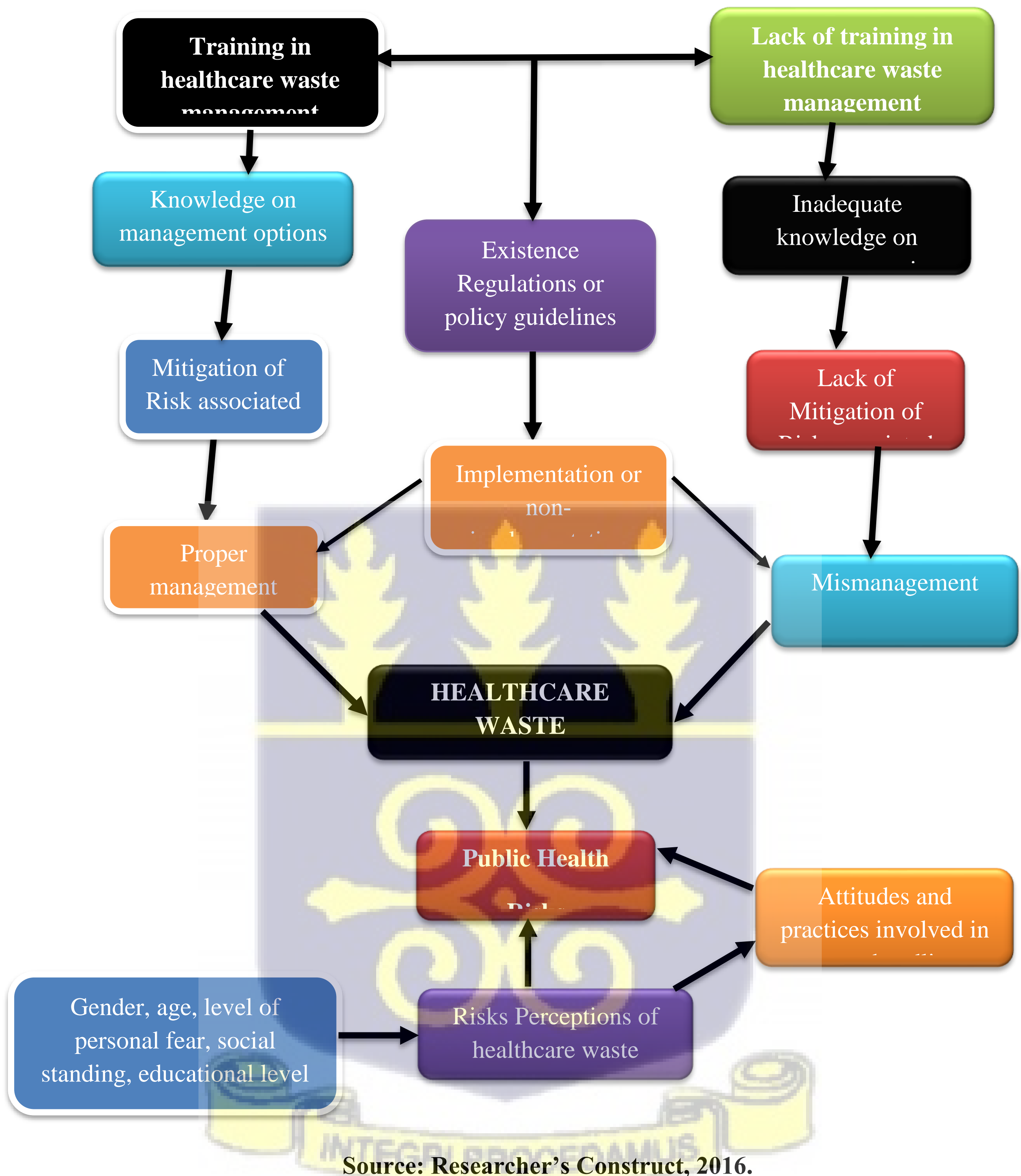
Figure 2.3. Conceptual framework on HCWM and Risk Perception



Source: Researcher's Construct, 2016.

From the conceptual framework, healthcare waste management could be affected by proper and effective management or mismanagement. Proper or poor management practices is each affected by certain factors which could stem from institutional lapses

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or work negligence on the part of healthcare professionals. From the conceptual framework above, the first and foremost factor is the existence or non-existence of regulatory frameworks or policy guidelines on the management of healthcare waste. Thus, the existence of regulations on the management of healthcare waste will ensure the availability of all necessary techniques and knowledge on proper management of the waste such as health education on the effective management of healthcare waste. This perpetuate good practices of healthcare waste management to which the risks to public health is guarded against as the waste is properly managed and disposed. On the other hand, lack of regulation on the management of waste will create loopholes for the proper management of waste as each institution is expected to manage the waste according to their own terms and conditions as stated by the sanitation policy and EPA Acts of 1994 (Act 490). This system by which waste management is left in the hands of or discretion of individual facilities is not healthy and helpful (MOH, 2006). Subsequently, the proper management of the waste implies, health professionals would have been giving training in waste management which will in turn grant them the necessary knowledge and techniques in waste management. These techniques and knowledge gained would go a long way to aid them in changing attitudes that would endanger their lives and the public at large. This ensures safety as good practices in healthcare waste management are gained to help in the mitigation of risks associated with improper healthcare waste management. The perception of health personnel is affected by social determinants such as age, sex, level of personal fear amongst others. A person's level of fear plays a role in rating his or her perception about something in relation to its gravity or harmfulness. According to the cultural theory personal fear and gender are linked to how a person rates harmfulness. Therefore, in this study, the social

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determinants would also affect how health professionals rate the dangers associated with healthcare waste with regards to perceptions.

On the other hand, the mismanagement of healthcare waste is affected by the lack of regulatory frameworks and policy guidelines. This breeds inappropriate waste management practices, which leads to lapses in the waste management process and subsequently lapses in the mitigation of risks associated with healthcare waste. The mismanagement of healthcare wastes will account for health risks to medical staff, housekeepers as well as the public which can occur within the health facilities or outside the facilities depending on how these wastes are disposed within the larger community. The mismanagement of the healthcare wastes stems the inadequate knowledge on the proper management of healthcare wastes which is in turn underpinned by the lack of or inadequate training on the management options that are available to health professionals and how effective these training sessions are.

Consequently, risks perception of health is determined by cultural factors such as age, level of fear, work experience, social standing and so on. These factors could affect a person's response to stimuli such as fear in different forms. Thus, the rating of risk by people differently is based on their cultural make up and how this intend affect their response to risk. Based on these cultural determinants that healthcare personnel possess, rating of risk would vary from person to person and hence will be on different scales. In the use of the cultural theory, culture herein is not defined in adherence to specific social group but rather in adherence to a particular way of life or cultural biases maintained and reinforced by beliefs expressed in the way of life; which are described in relation to a certain social order (Douglas, 1982). Moreover, cultural theory postulates four main ways of life and four corresponding cultural biases which are hierarchy, egalitarianism, individualism and fatalism. It is thus contended that the four

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biases are not islands on their own but tend to co-exist within the same geographical space or region or social group. Thus, attitudes relative to risks is an aspect of worldviews that can be studied within the framework of cultural theory (Douglas and Wildavsky, 1982). Hence, risk perception is held as a reflection of the way in which society and societal activities are perceived. This consequently led to alternative views about risks that stem from patterns of social relations. In addition, an advantage of cultural theory is that, it has grip on both social and economic issues without strain (Thompson, Ellis and Wildavsky, 2018). In understanding culture relative to cultural theory, culture herein is regarded as complexes of concrete behaviour patterns that stem from such things as traditions, habit clusters, customs and usages but also as set of control mechanisms for the governing of behaviour (Elkins and Simeon, 1979). In view of this, the risk perception assessment concentrated on the risks associated with sharps and needle operation and the perceived risks from inappropriate waste segregation as well as risk to public health. These were taken into consideration relative to the hazards that were identified in literature with regards to the total handling of healthcare waste. It must however be noted that, estimates of infection frequency was based on first-hand information provided by the respondents or the data collected on the field as shown in the questionnaire. Perceived risk ratings were also based on the data collected during fieldwork. Risk perception assessment from inadequate waste segregation was determined using the frequency of wrong segregation as demonstrated in the questionnaire. A hazard has the probability to become a risk which in turn depends on the local conditions. Thus, healthcare wastes that is properly managed leads to the control and minimization of risks to persons. On the other hand, if healthcare wastes are poorly managed, the risky clinical part of the wastes has the potential to imperil the health of medical staff, housekeepers, communities as well as pose risk to environment.

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The risks associated with healthcare wastes are considered greater than those caused by poor management of municipal wastes including spread or diseases by vectors and animals; air and water contamination, fire risks due to the methane production during organic matter degradation and combustion. Thus, the health risks from healthcare wastes when it is properly managed or the necessary guidelines are not implemented for which healthcare staff will be given the needed training will account for risk perception these professionals will form regarding the potential risks associated with healthcare wastes. The risk perception level ratings that are indicated by the healthcare workers are underpinned by their psychological and demographic characteristics relative to the principles of cultural make-up. As stipulated by cultural theory, there is a linkage between risk perception which is formed by people based on demographic and psychological characteristics and perceived solutions in reducing risk. Thus, from the conceptual framework, the risk perception of health personnel about the risk associated with healthcare waste is a function of the attitudes and practices of personnel regarding healthcare waste and its total handling and how directly personnel are involved with healthcare waste.

2.17.2 The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) was propounded by Azjen (1985) in response to the weaknesses of the Theory of Reasoned Action (TRA). Thus, perceived behavioural control was included in the TRA model as a way of addressing the identified limitation in the TRA. The TPB applies principles in cognitive perspective in explaining human behaviour underpinned by their beliefs and attitudes. In the TPB, the prime predictor of behaviour is the intention to act under volitional behaviour as depicted in figure 2.2. Consequently, the attitude of a person as well as subjective and perceived behavioural control rules predict a person’s behaviour intentions. This means

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that, the greater a person aims to accomplish a behaviour, the greater the probability that the behaviour will actually be made (Darker, Larkin and French, 2007). The TPB suggests that, any developed attitude is the summation of a number of beliefs which the behaviour will produce certain outcomes and evaluation of the weightiness of the outcomes of the behavioural beliefs. Relative to the tenets of TPB, subjective norms are determined by their beliefs of normativity and the incentive to fulfil or conform. Beliefs of normativity refers to the behavioural expectations that an important person or certain groups will approve or discarded of behaviour and incentive to conform is that person's general propensity to associate with the commands of the prominent group (Fishben and Ajzen 1975; Armitage and Conner, 2001). However, PBC is reinforced by varied beliefs of control and intended power of the beliefs which is parallel to ideas of self-efficacy (Terry & O'Leary, 1995; Bandura, 1997). Control beliefs on the other hand, are factors and conditions that are perceived to be present and might influence or hinder the performance of behaviour whilst perceived power is associated with the perceived effect that facilitates or inhibits factors that propel the put-up of a behaviour. According to Conner and Armitage (1998), factors that limit or promote certain behaviours include internal factors such as information, external control, personal deficiencies, skills and emotions, dependence on others, opportunities and barriers. Fisher and Fisher (2000) opines that if perceived control is absent, the TPB is practically the same as TRA. This makes it possible for the general weaknesses with TRA being applied to the TPB. However, the perceived behavioural control is at times not seen as a constraint in demonstrating planned behaviour in every case. This was reinforced by Rye (1999) through the example that safe sex behaviours are under volitional control making TPB reverting to TRA which makes perceived behavioural control immaterial to such behaviours. For example, a person who is ill-motivated person might not consider the

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supposed perceived behavioural controls but rather continue to perform the action. In addition, in situations where the egoistic part of a person dominates the superego, perceived controls might be redundant. According to Fisher and Fisher (2000), TPB tend to disregard the role of the type and magnitude of information and behavioural skills needed by a person to carry out and maintain explicit actions. Fisher and Fisher (1992) adding to the theory developed the information-motivation-behavioural skills which is needed to maintain behaviour. This holds vital because the behaviour of an individual could be influenced by the extent of information or previous experiences or external stimuli such as level of provocation before an action is taken. For instance, Quine and Rubin (1997) revealed that previous behaviours induce new behaviours through attitude and perceived behavioural control. Thus, the role of information and past experiences cannot be overlooked or underrated in behavioural studies. This was further emphasised by Pred (1967) through behavioural matrix. In criticising the TPB, Fife-Schaw, Sheeran and Norman (2007) said the TPB is a good model for predicting behaviours but failed to stipulate how the behaviour predictors such as attitude, subjective norm and PBC can be changed to produce the preferred behaviour intentions. In a situation of altering an undesired behaviour, there is the question of which predictors should be targeted and what should be the magnitude of alteration with respect to the variables and how the alteration should be done is not addressed in the theory. Thus, the predictability contribution of every variable to behavioural intention must be known. In using the TPB, meta-analysis depicts norms of subjectivity, attitude and PBC do explain about 30% to 50% of variance in intention to perform an act (Sheeran and Taylor, 1999; Armitage and Conner, 2001) whereas intention and PBC cater for 20 percent to 40 percent of explanations of difference in behaviour (Armitage and Conner, 2001). Regardless of the weakness of the TPB, it is very useful for this

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study. Conner and Armitage (1998) contend that the theory is comprehensive enough and vital in understanding and reviewing human behaviour because varied factors that tend to affect behavioural intention will exert its effect through predictors. To Abraham and Sheeran (2003), every theory tends to be parsimonious where some variables ought to be measured to attain a precise estimate of a behaviour. Secondly, to ensure predictive accuracy of the model, the theory provides definitive guidelines on how to measure thoughts or intuitions as specified by the model (Ajzen and Fishbein, 1980). For example, the theory of planned behaviour tends to highlight the essentiality of safeguarding measures relative subjective norm, PBC, attitude, intention and behaviour are well-suited (Abraham and Sheeran, 2003). According to the theory of planned behaviour a person's behaviour is determined by a combination of personal beliefs, referent beliefs and control beliefs. Its application in this study, the theory of planned behaviour is juxtaposed with the action and inactions of healthcare employees regarding the total handling of healthcare waste in health facilities. It is used to explicate certain attitudes that were observed on the field during the data collection process.

2.18. Chapter Synopsis

The chapter was devoted to review the literature and was thematically organised under appropriate headings regarding the various themes discussed, beginning with the meaning of healthcare waste, categorisation of health care waste, management of health care waste, legislative and regulatory framework. Education and training of healthcare staff, minimisation of HCW in facilities, handling of waste, segregation of waste, storage of HCW, Collection and transportation waste and risk perception of waste, waste management in Ghana were some of the thematic areas reviewed sequentially. The chapter further discussed the two theories, that the cultural theory and the theory of planned behaviour and their application in the study.

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CHAPTER THREE

STUDY AREA AND METHODOLOGY

3.0 Introduction

This chapter discusses the study, research design and research methods adopted in the study. The chapter is in two main parts. The initial part presents a description of the study area whereas the second part focuses mainly on the research methodology. The first part as indicated earlier focuses on the description of the physical environment and the socio-cultural and economic characteristics of the area. This section provides the geographical and socio-demographic context for understanding the health waste management practices and attitudes of the health workers in respect of health care waste management in the Ho Municipality. The second part which focuses on the methodology discusses the research design and research methods, sampling technique, sample size, data collection instruments as well as how data were analysed.

3.1 The study area

The research was undertaken in the Ho Municipality of the Volta Region. An in-depth description of the Region and the location of the study area are provided below. The Ho Municipality is one the five Municipalities in the Volta Region. It was established by a legislative Instrument (L.I) 2074 of 2012.

3.1.1 Location

The Ho Municipality lies between latitude 6° 20” N and 6° 55” N and Longitudes 0° 12’’ E and 0° 53’’ E. The Municipality shares borders with Ho west district to the North and west, Adaklu-Anyigbe to the south and the Republic of Togo to the East. It has a total land area of 2,361 square kilometres representing 11.7 percent of the regions total

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land area. By Location, the Ho Municipality can have strong economic co-operation with neighbouring districts. Two district that were originally part of the Ho Municipality have been carved out and are the Agortime-Ziope and Ho West districts. Ho which is the administrative capital also serves as the economic hub for the Volta region. Ho Municipality hosts some of the earliest missionary churches especially the Evangelical Presbyterian Church in the then Gold Coast.

Figure 3.1: Map of the Ho Municipality

Source: Ho Municipal Assembly 2016

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3.1.3 Relief and Drainage

The general relief of the Ho Municipality is made of both mountainous areas and lowland areas. Mountainous parts of the Municipality are mostly to the north and northeast of the Municipality and are part of the Akwapim-Togo Ranges. Their heights range between 183metres to 853metres above sea level. Notable areas are the Awudome stretch in the southwest, as well as the Matse and Klefe in the northeast. Low-lying areas are to the south of the Municipality with heights ranging between 60metres to 152metres.The general pattern of the Ho Municipality is southwards that is dominated by rives such as Tsawe (Alabo) and Kalapa which flow into the lower Volta or Avu lagoon. These rivers are seasonal and therefore do not serve as all year-round dependable sources of water supply despite the numerous tributaries.

3.1.4. Climate and Vegetation

Mean monthly temperatures of the Municipality range between 22°C and 32°C while the annual mean temperatures range from 16.5°C to 37.8°C. This implies that, temperatures in the Ho Municipality are generally high and thus good for both plant and crop food faming. During the dry seasons, temperatures become high making the cultivation of food crops difficult except for irrigation. Mountainous areas such as Amedzofe, Vane, Biakpa and Ashanti Kpoeta do have very low temperatures during some parts of the year and are often referred to as 'Local Winter' in Volta Region. These low temperatures that are recorded at certain times of the year do have tourism potentials for some foreigners and locals who enjoy these temperatures. For example, Amedzofe is noted for recording temperatures as low as 16.6°C in the month of July. Similarly, average mean humidity for the same place (Amedzofe) is said to be 70 percent and 90 percent at 06:00hours and 53 percent and 85 percent at 15:00hours

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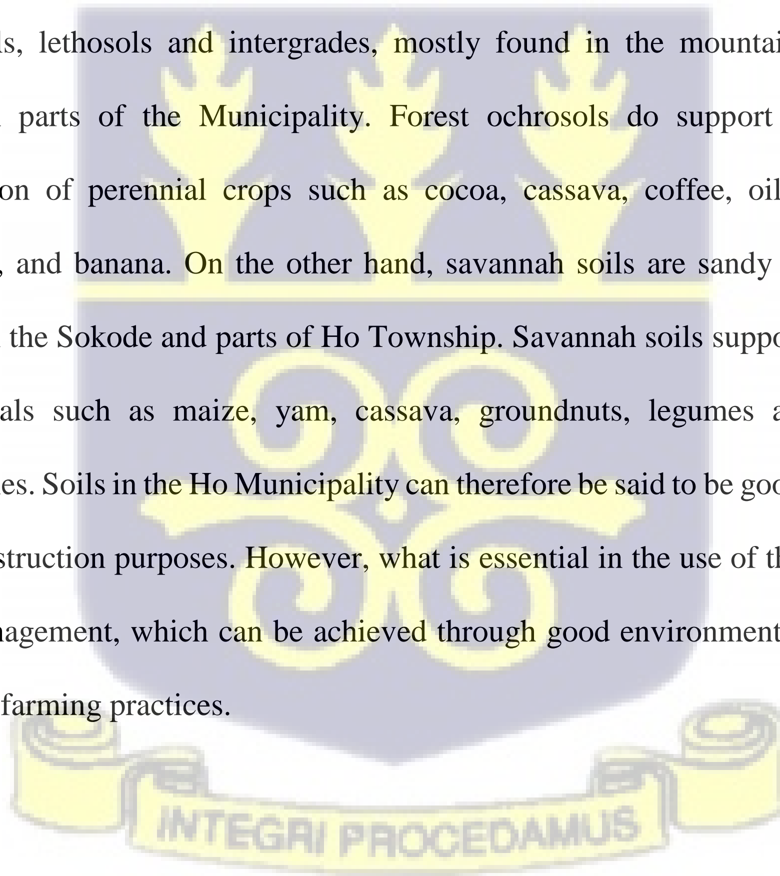
Greenwich Mean Time. Ho Municipality is made up of two main vegetation zones namely-the moist semi-deciduous forest covering mostly the hills in the Municipality; and the savannah woodlands which is extensive and covers the rest of the Municipality. The Municipality can boast of 33.83 square kilometres of forest reserve at two main locations-Ho Hills and Kabakaba Hills, with other smaller reserves at Abutia Hills, and Klemu Head waters.

3.1.5. Geology and Soils

Several soils can be found in the Ho Municipality. These could be put into two major groups namely the forest soils and the savannah soils. Examples of forest soils are forest ochrosols, lethosols and intergrades, mostly found in the mountainous and wetter northern parts of the Municipality. Forest ochrosols do support the growth and cultivation of perennial crops such as cocoa, cassava, coffee, oil palm, avocado, plantain, and banana. On the other hand, savannah soils are sandy nature. They are found in the Sokode and parts of Ho Township. Savannah soils support the cultivation of annuals such as maize, yam, cassava, groundnuts, legumes and a variety of vegetables. Soils in the Ho Municipality can therefore be said to be good for agricultural and construction purposes. However, what is essential in the use of these soils is good soil management, which can be achieved through good environmental protection and suitable farming practices.



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3.1.6. Rainfall

The rainfall pattern of the Ho Municipality is characterised by double maximum rainy seasons referred to as major and minor seasons. The major commences from March to June whilst the minor season is from July to November. With this season the Municipality has about four to five months of dry season depending on the rainfall pattern of a particular season. Mean rainfall figures range between 20.1mm to 192mm. The highest rainfall occurs in the month of June and has a mean value of 192mm while the lowest usually occurs in October or November averaging 20.1mm.

3.1.7. Health

The Ho Municipality has a total of twenty-nine (29) healthcare facilities in its catchment area which are both public and private. It has an MRS hospital which belongs to the Military, The Municipality has twenty-six (10) Health centres, two of which are not functioning and a number of other health facilities. The Municipality has a regional hospital, a municipal hospital, over 26 health centres, 5 private hospitals and 3 Christian Health Association Clinics.

3.1.8. Population Size, Structure and Composition

Reference to the 2010 population and housing census, the total population for the Ho Municipality stood at 271 881 people representing 12.8 percent of the region's inclusive population. Of the current population, 52.7 constitute females whilst males constitute a 47.3 percent. The Municipality has about 62 percent of her population residing in urban areas. The municipality has a sex ratio of 89.7 and the population less than 15 years or the youthful age accounting for the 31 percent of the population of the Municipality.

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3.1.9. Political and Administrative Structure

Ho Municipal Assembly is made of forty-three (43) members, constituting twenty-nine (29) elected Assembly members, fourteen (14) government appointees, one (1) Member of Parliament and a Municipal chief executive. She has a number of sub committees that perform various functions. These include the social services, works, development planning, Justice and Security, Finance and Administration, gender, waste and sanitation, tourism, agriculture and environmental sub-committees. It also has a number of zonal councils namely the Ho zonal council, Sokode zonal council, Dutasor zonal council, Hokpeta zonal council and Norvisi zonal council.

3.1.10. Economy

Although the Ho Municipality is an urban setting, agriculture is the backbone of the economy. The agricultural sector employs about seventy percent of the economically active labour force. Virtually every household in the Municipality is engaged in one form of agricultural related activity. Farming which very common basically occurs at the subsistence level. The average acreage of land cultivated ranges between 4-6 acres for all forms of crops. Despite its significance in the Municipality's economy, much of the agricultural potentials in the Municipality still remain unutilised. For example, out of a total of 62,261 hectares of arable land, only 23, 168 hectares are currently under cultivation or utilised. Irrigation potential also remains untapped. The economy of the municipality is also characterised by large number of small scale commercial and industrial activities. These small-scale enterprises and industrial activities are concentrated in the city centre, making it the business hub of the Municipality. People are in various forms of employment-both in the public and private sectors. The public

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sector employs about 10 percent of the workforce whilst the reaming is employed by the private sector usually dominated by the informal sector.

3.1.11 Medical waste management in the Ho Municipality

Healthcare waste management in the Ho municipality is carried out by each facility. Thus, each facility is expected to effectively mange their own generated healthcare waste. However, the collection of healthcare waste from the various health facilities in the municipality to the dumping site is carried out by the municipal Assembly. The initial interaction or visits to the Municipality before this study was carried, it was observed that the trucks that carried and transported waste from the various healthcare facilities were not labelled appropriately to indicate whether the waste being transported were infectious waste or general waste. It was again observed that, both domestic wastes was mixed together with healthcare waste to dumping sites.

3.2 Research Methodology

3.2.1 Research Design

The research design adopted in this study is the mixed method approach. Given the nature of the study and the need to obtain a thorough understanding of the issues examined, the convergent mixed method strategy was adopted. This implies that both quantitative and qualitative approaches were used for achieving the objectives of this study. Creswell (2012) suggests that, within the social, behavioural and health sciences, the mixed method strategy is an approach in which the researcher gathers both quantitative and qualitative data for analysis and interpretation. Others indicate that the mixed method is used when a researcher uses qualitative and quantitative methods in an attempt to confirm, cross-validate, or corroborate findings within a single study (Steckler et al.,1992; Morgan,1998). These two approaches have been asserted by Teye

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as complementary since they make up for each other's weaknesses and very useful when examining complex phenomena (Teye, 2012), which must ensure robust outcome (Creswell, 2009). The quantitative approach resonates within the positivist paradigm and views science as value-free, neutral and objective. Its purpose is to explain generic behaviour patterns and it is useful for analysing quantifiable data, generalisations and predictions (Teye, 2012). Be that as it may, the quantitative method is not very good at providing detailed account of peoples' perceptions, emotions, beliefs, experiences and behaviour (Brannen, 1992; 2005). It gives much priority to subjective interpretation than objective data. It is upon this weakness of the quantitative method that I employed the convergent mixed method in order to also make use the qualitative method. The qualitative method entails the use of words and narratives. It is argued that the qualitative method is very effective for detailed explanations on behaviours and experiences in research (Bryman, 2016). However, an inherent weakness in the use of the qualitative method is that, it is not effective in establishing patterns and relationships among variables and cannot be used for making generalisations about the population being studied (Plano Clark et al., 2008 as cited in Teye, 2012).

Thus, the use of the convergent mixed method in this study was to help the researcher overcome the inherent weaknesses in each method and to take advantage of the combined advantages of using both methods. As expounded by Teye, the quantitative approach lays emphasis on the use of robust statistical tools for making generalisations and predictions while the qualitative approach involves perceptions experiences, beliefs, emotions and behaviours. Therefore, the mixed method strategy would widen the scope of the research than initially planned (Teye, 2012). This is further reiterated by Sharan that the different interpretations of reality as a consequence of mixed method offers valuable tool for analysis and better understanding of complex issues (Sharan

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2002, cited in Creswell, 2009). In this study, the use of the mixed method enabled the researcher to enhance the validity of the findings (Bryman, 2016) and helped to obtain deeper understanding of the specific issues unearthed by this study due to the flexibility of the qualitative method (Clark et al., 2008). On the basis of convergent mixed method, quantitative and qualitative data were concurrently collected. In-depth interviews and content analysis as qualitative methods were used in analysing interest in various players. These qualitative techniques helped me to elicit responses on the social behaviour of people in terms of their perceptions and lived experiences on issues of waste management.

Through in-depth interviews, it was possible to elicit personnel's perceptions and understood actions and experiences as well as contested views on waste management practices. The qualitative techniques provided access to motives, aspirations and power relationships that accounted for how people, places and events were represented (McGuirk and O'Neill, 2016). Moreover, in-depth interviews were used to elicit reasons for certain actions that were performed by personnel on waste management practices, knowledge and attitudes. Through interviews, reasons were given by waste workers on why they work without full protective gear and the absence of waste generation records. In contrast, quantitative data filled the gap in areas where rates and charts were necessary for depicting frequencies and percentages. Quantitative data was collected through survey questionnaire. I solely administered the questionnaire to respondents. The use of both qualitative and quantitative techniques enabled me to untangle the diverse scopes of the research problem.

INTEGRI PROCEDAMUS

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3.2.2 Data Sources

Data for this study were derived from both primary and secondary sources. Primary data was gathered through the use of interview guides, survey questionnaire and observations (Curtis, 2008). Primary data were used due to the originality and reliability of the facts of information. However, sourcing data was fraught with some challenges. For instance, few respondents refused to answer questionnaires with the justifications that several studies conducted had not improved anything in the sector whereas others claim they had no time. On the other hand, secondary data was obtained from WHO, MOHGh, GSS and other related healthcare waste management articles, books, newspaper reviews, reports and publications. The secondary data sources were used since they were more convenient, saved time and were comparatively less expensive and gave new insights from previous analyses of similar studies (Johnston, 2017).

Data Collection Methods

Data for this research was equally collected using a mixed method approach; thus, both questionnaire and in-depth interview guides were used to gather quantitative and qualitative facts respectively.

3.2.2.1 Questionnaire Survey

Questionnaire made it possible for data to be collected from a sample of health personnel working in the Ho Municipality. This survey was done to collect data needed to test the study questions concerning the management of healthcare waste. The use of the questionnaire survey helped the researcher found answers to questions through the

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analysis of descriptive statistics and relationships between variables. This method of quantitative data collection was used because it provided accurate and precise facts needed for the description of issues, events, and phenomena (Bryman 2016; Creswell, 2003; Saunders and Thornhill, 1997). The questionnaire was made up of both closed and open-ended questions. The questionnaire was thematically organised under background information of respondents, knowledge of healthcare waste management, regulation of healthcare waste, on-site transportation, waste segregation, waste storage and treatment and risk perception. In order to ensure that the respondents accurately understood the questions and also to enhance the response rate, the administration of the questionnaire was done by the solely by the researcher. The questions read out to the respondents for suitable responses. A few of the respondents were permitted to complete the questionnaire on their own, but this was done in the presence of the researcher. A copy of the questionnaire is presented in Appendix I. Although the survey design could not capture the real meaning of social behaviour, it was adopted in this study because it was one of the best methods of collecting quantifiable data that described patterns and relationships between variables of interest. However, the questionnaire was pretested in the Keta Municipal Hospital with 20 healthcare personnel for validity and reliability checks which corrected noted inconsistencies.

3.2.2.2 In-depth Interviews

An interview is a purposeful conversation between two or more people that requires the interviewer to establish a relationship, to ask succinct and explicit questions, to which the interviewee listens assiduously and responds willingly (Saunders et al., 2012). In order to gather detailed explanation on healthcare waste management practices, 10 health personnel were interviewed and the interviews recorded and transcribed. The

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interviewees were purposively selected. The researcher interviewed one hospital matron or medical superintendent of each selected health facility. There was a structured interview guide but the process was very flexible. The use of the interview guide was consistent with the general practice of health geographers who in their humanistic approach recognize that human behaviour is subjective, complex, illogical and self-contradictory. It is in this wise that the researcher as a student of human geography drew on techniques that allowed me to delve into the meanings, emotions, intentions and values that make-up our taken-for-granted life worlds (Ley, 1974; Bryman, 2016). Other respondents selected were facility administrators and as well as waste workers in the selected health facilities. Some of the themes covered by the interviews include, the presence of a waste management plan, segregation practices, and attitudes towards waste management.

3.2.2.3 Field Observation

A phenomenon's status is determined by asking, observing, or a mixture of both. Observation is utilized as a research method in some studies and as a data gathering strategy in others. Observation is used in mixed method research as well as basic and applied research (Ciesielska, Bostrom, and Ohlander, 2018; Cohen, Mannion, and Morrison, 2017). Strong opines that it is impossible to expect any researcher to have no impact in the field during data collection (Strong, 1974). This presupposes that every researcher to an extent exerts some form of personal observations to cross validate or check observed phenomenon on the field. Direct observation was carried out in all facilities selected for the study. For each observation, written and oral permissions were sought from the facility administrators and person in charge of units the observations were carried out, though informal observation was also done. Observations were made

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in the areas of waste handling, on-site segregation, collection and transportation, storage and disposal, recapping and used needles management, types of sharp boxes in use boxes, disposal of sharps and the transportation and treatment of placentas and incineration of waste. Direct observations were also conducted in some patient wards within facilities that had in-patients as well as the out-patient-department. During the observation detailed notes and photographs were taken during each visit with permissions. Data from observations was triangulated with in-depth interviews, document review and questionnaire.

3.3. Sampling Technique and Sample Size

Though the research adopted a case study research design, selection of facilities for the survey was done through a multi stage sampling technique using both public and private, health centres, clinics and community health planning services compounds (CHPS).

Sampling procedure: the healthcare establishments were grouped into three categories thus; advanced, intermediate and basic in relation to the level of operation. The advanced facilities described herein involved the teaching and district hospitals whereas the intermediate had to do with health centres and clinics and the basic healthcare facilities involved community health planning services compounds. After the groupings, the lottery technique of simple random sampling was used to select the facilities that fell under the basic category. This was done through the lottery system in where the names of the facilities were written on cards and placed in a basket for random picks. This was to give each facility an equal chance of being selected. The advanced facilities including the teaching and municipal hospital where purposively selected because these facilities served as the main referral centres. The use

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of both simple random and purposive sampling procedures was appropriate for the study because, they actually aided in the achievement of the anticipated representation of the target population with minimal bias (Sekaran, 2010). Finally, several observations were made and digital pictures taken to support findings from facilities visited.

3.3.1 Sampling of healthcare facilities

The Ho Central Municipality has a total of fifty-five (55) healthcare facilities in its catchment area which are both public and private and at the various levels of healthcare delivery system in Ghana. It has a 7MRS hospital which belongs to the Military. So, categorising this as private or public healthcare facilities gave a total of forty-four public healthcare facilities and eleven (11) private healthcare facilities in Ho Municipal.

Table 3.1. categories of healthcare facilities

Category of Facility	Number
Public	44
Private	11
Total	**55**

In expanding the above table and explaining the sampling of the facilities, the various facilities that make the fifty-five are illustrated in table 3.2 below:

Table 3.2. Types and number of health facilities in Ho Municipal

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Health Facility	Number	Category
Regional Hospital	1	Public
Municipal Hospital	1	Public
7MRS Hospital	1	Public
Polyclinic	1	Public
Health Centres	28	Public
Private Clinics / hospitals	8	Private
Health Units	2	Public
CHPS Compound	5	Public
RCH	4	Public
Quasi Government Institution	1	Public
Private Maternity Homes	3	Private
Christian Health Association Clinics	3	Private

The simple random sampling was performed through where the names of all health centres and CHPS on one hand and the names of the included private facilities were written on pieces of papers and put in a pot. The researcher then randomly dipped his hand to and picked the facilities for the study. This made sure that each facility had equal chance of being selected. Therefore, the outcome of the both the purposive sampling of the referral hospitals and the use of the sample random sampling in selecting the others making the total number of facilities that partook in the study is represented in the table 3.3 below:

Table 3.3. Sampled Healthcare facilities

Name of facility	Category
Trafaga	Public
Municipal Hospital	Public
Holy Hospital	Private
Matse Health Centre	Public
Hodzo Health Centre	Public
Ho Polyclinic	Public
Sefe Clinic	Private

This put in percentage terms of the government facilities sampled at 80 percent and the privately-owned facilities at 20 percent.

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3.3.2 Sampling and Sample Size for Quantitative Data

The study made use of health staff population statistics from the Regional Health Directorate of the Ho Municipal. One major flaw of the statistics from the Regional Health Directorate was that it was not current since it was statistics for the previous year and did not reflect the current population of health professionals in the Municipal. Since that was the only statistics available at the time during the fieldwork, the statistics collected was used to compute the sample size for the administration of the survey questionnaire.

The sample was calculated based on the model suggested by Kothari et al. (2004) as depicted below:

$$n = \frac{Z^2 pqN}{(N-1)e^2 + Z^2 pq}$$

Where:

n = is the anticipated sample size with a target population less than < 10,000.

z = is the standardised deviation at a confidence level of 95 percent which is 1.96.

p = percentage in the target population that assumes the characteristics being sought. Thus, in this study 80:20 is assumed indicating a probability of 80 percent (0.8)

q = balance from p to make up to 100 percent- that is 1-P which is 20 percent (0.2) in this case

e = is the margin of error which is 0.05

N = is the total population to be sampled, which is 585

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Thus, the effective sample size for the quantitative data was and for the study was derived as;

$$n = \frac{1.96^2 \times 0.8 \times 0.2 \times 585}{(585-1)0.05^2 + 1.96^2 \times 0.8 \times 0.2}$$

Therefore, $n = 173$

The study sampled 173 respondents which formed 29.6 percent of the total population of health professionals in the study area, however, a total of 165 respondents which formed 95 percent of the accessible population took part in the survey instrument. Thus, the estimated sample size was large enough for the purposes of quantification and representation of the whole population for the quantitative research (Bazeley, 2004, cited in Teye, 2012). This is because, it is generally recommended by social researchers that a sample should be about 10-30% of the population to be researched Naing, Winn and Rusli, 2006; Mugenda and Mugenda, 2003). Questionnaires were administered in the sampled facilities to ensure a reasonable representation of the population and permit a comprehensive analysis and interpretations. The estimated study sample was drawn from the strata which encompassed the various categories of healthcare professionals namely nurses, doctors, medical lab officers, waste workers, pharmacists, public health officers and other auxiliary staff. In all a total of 173 respondents were expected but only 165 questionnaires were retrieved due to non-response.

3.3.3 Sample size for Qualitative Data

The various respondents for the qualitative data were purposively selected. The power of selective sampling lies in the selection of the preferred cases with rich information for the in-depth interviews with regards to the factors associated with the main issues under study. A sample must be sufficient enough so as to capture the desired effect sizes and represent a population (Sullivan and Feinn, 2012). A total of 12 interviewees took

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part in the in-depth interviews. According to Teye (2012), interviews for qualitative data do not necessarily require large sample sizes since emphasis is placed on processes and meanings and the cases with rich information. Although, Teye pegs qualitative interview figures at 20-40, this research settled on 12 as a result of field challenges and because the study adopted a concurrent mixed method of data collection. The oral interviews were conducted with facility health administrators, medical superintendent, in-charges, waste workers, nurses and the estate manager. These respondents were interviewed because they dealt directly with health issues of the facilities and superintended over records as well as being in positions of influence. The interviews were intended to induce information on factors that affected healthcare waste management in the facilities of healthcare in the Ho Municipal.

The table below is a summary of the various respondents that took part in the in-depth interviews for the for the qualitative data.

Table 3.4. Sampled Respondents and their designations

Designation	Frequency	Number of interviews
Doctors / medical superintendent	2	2
Waste workers	4	4
Estate Manager	1	1
Nurses	3	3
Health Administrators	2	2
Total	**12**	**12**

3.3.3 Inclusion and Exclusion

The study included facilities coded as advanced, intermediate and basic per this research. However, RCH, private maternity homes and Christian Health Association clinics were excluded from the sampled facilities that took part in the study. The 7MRS hospital was also excluded because the necessary documentation and ethical issues in

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terms of permission needed before the researcher would be granted access to the facility was not received as at the period the data collection carried out. In total, 14 healthcare facilities were excluded from the research. Based on these criteria of inclusion and exclusion, the total number of facilities that was available for sampling was now 41.

3.4 Reliability and Validity of Research Instrument

Reliability and validity are vital indicators of measuring research instrument. Reliability of an instrument deals with the consistency of measurements which could be from time to time, item to item, form to form or from a rater to another rater. Validity of a research instrument is considered as the extent to which an instrument truly measures what it is intended to measure or purports to measure. Thus, validity concerns itself with the relevance of a research instrument in addressing a study's aims and research questions. However, it must be noted that reliability and validity are context-specific features per situation or circumstance. A reliable measuring instrument contributes to validity but a reliable instrument need not be valid instrument.

3.4.1 Reliability

Reliability of research instrument is considered as the consistence of the instruments with regards to results it generates. Therefore, the reliability of the survey instrument was analysed using Cronbach's Alpha coefficient which ranges from 0.00 to 1.0 depicting any figure within this range implies the instruments is reliably good or excellent. Thus, a value of 0.70 and beyond is acceptable or permissible for any empirical research (Tavakol and Dennick, 2011). A number of methods are used in measuring reliability whose suitability is reliant on a study's specific aim. Basically,

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there are four strategies namely the test-retest, the parallel forms, internal consistency and rater to rater (Knapp & Mueller, 2010). Though, all four are based on classical test theory, there are alternative reliability measurements methods- item response theory, generalizability theory and structural equation modelling. Reference to this research, internal consistency method was applied to determine the reliability of the consistency of the instrument because it is the most extensively used method for estimating reliability in exploratory research (Onwuegbuzie & Daniel, 2002). Thus, internal consistency was performed with the research instrument which consisted of multiple items measuring the same construct. Here, the measurement was run once with the items being treated as forming two parallel halves of the instrument. The value for α typically depicts the percentage of reliable variance for the instrument.

The coefficient is computed from Cronbach's alpha using the formula

$\alpha = \frac{kr}{(1+k-1)r}$ or $\alpha = kr\ /\ (1 + k - 1)\ r$

Where k = the number of items in making up of items

r = the mean inter-indicator correlation

The reliability of the research instrument applicable to this study established on Cronbach's is **0.968** which signifies an excellent reliability (See Appendix).

3.4.2. Validity

The validity of a research instrument defines the extent to which an instrument measures what is it purported or intended to measure (Knapp & Mueller, 2010; Kimberlin and Winterstein, 2008). For a measure to be valid, it must measure what is supposed to measure by doing neatly without incorporating other factors inadvertently. The emphasis here is not basically on items or scores but inferences made from the

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research instrument- that is behavioural inferences can be extrapolated from the test scores and these must be suitable, meaningful and useful to be valid. The research instrument was first pre-tested with some respondents of Keta Municipal hospital to check the depth of the items. Responses form the pre-test were efficiently used to enhance the instrument's content which eliminated ambiguities and duplications.

3.5. Operationalisation of variables

3.5.1 Human Resource Factors:

This variable was measured using both a Yes or No as well as a five-point scale which measured the healthcare staff's knowledge of healthcare waste system, attitudes of healthcare personnel towards waste management system adoption and the level of practice adopted in a particular facility. Thus, a five-point Likert scale was applied which involved- Strongly Agree 5, to Disagree 1 for responses in the survey questionnaire.

3.5.2 Healthcare waste management Processes

Wastes management processes were measured using items that were suggestive of efficient healthcare waste management process. The suggestive items looked at waste segregation and containment, transportation as well as treatment and disposal. It sought to find out whether definitive paths were clearly defined in the waste handling ranging from waste minimisation to disposal options.

3.5.3 Healthcare waste management System

The HCWM System is the dependent variable which was measured as a one dimension. The HCWM system was measured through the availability of functional waste management plan, environmental or waste management officer, training plan on

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healthcare waste management and the availability of the appropriate PPEs for waste management.

3.5.4 Presence of incinerators or incineration facilities

To ensure the effective treatment and disposal of waste generated, the Ministry of Heath guidelines on healthcare waste management has indicated the incineration of wastes as the most common and effective method of waste treatment and disposal option. This study relative to the treatment of waste sought to find out whether the various facilities studied had incinerators and whether these incinerators were operational and working at full capacity. Hence, the presence of incinerators herein is seen as a one directional variable relative to the waste treatment options available to facilities.

3.5.5 Segregation practices

Waste segregation practices were operationalised by a question, asking whether generated wastes were segregated or sorted. It was also measured by the question of whether segregation was done on site before the transportation of the waste.

3.5.6 Availability of HCWM Policy Guidelines and Implementation

The availability of the national HCWM Policy Guidelines was measured using two dimensions. It measured whether the policy guidelines on healthcare waste management was available in each facility and whether the facilities had waste management committees for the implementation of the stipulated directions in the guidelines for the management of HCWM in the facilities. It was measured with a two-

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dimensional variable of Yes and No and whether the guidelines were effectively and meticulously followed.

3.5.7. Availability of waste management committees in facilities

The availability of waste management committee waste evaluated as a one directional variable. It was evaluated on the basis of whether healthcare facilities instituted healthcare waste committees and whether these committees were operational.

3.6 Data Analysis

The data was represented through the use of simple descriptive statistics such as percentage values which have considerable merit over other complex statistics values (Kaur, Stoltzfus & Yellapu, 2018). Thus, the study made use of descriptive statistics including frequencies, percentages, means and standard deviation to analyse the quantitative data. On the other hand, inferential statistics such as correlation and logistics regression were quantified to give intuitions on the relationship between variables: dependent and independent variables. Data collected were generally analysed using SPSS version 21 to generate frequency tables to represent the findings of the research whereas the Microsoft Excel software was used to generate 3D pie and bar charts. Data from the in-depth interviews were first transcribed, coded and organised into reasonable themes for a comprehensive and intensive content analysis and discussion. Subsequently, Chi-square analyses were run to establish the relationship between some variables like age, gender, education and waste management. The decision rule for the chi square test was that, variances in results become significant if the 'p' value of the computed result was less than 0.05 and insignificant if the 'p' value

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was greater than 0.05. Binary logistics regression was also conducted to estimate the effect of sociodemographic variables such as sex and education on healthcare workers' knowledge on healthcare waste management.

3.7 Ethical Consent and Confidentiality

A formal authorisation was sought from the Regional Health Directorate, the Municipal Health Directorate and the Heads of the various health facilities that were sampled to take part in this survey. Study objectives were communicated to the various persons that were in charge of helping in ensuring the research was conducted. For confidentiality protection no names or other identifying information were collected from persons interviewed or observed. No photographs of patients and private rooms were taken only those of waste management processes and waste personnel. To ensure the confidentiality of interview data, each respondent was given a unique numeric identifier.

3.8 Chapter Synopsis

The chapter three looked at the characteristics of the study area, methodology, the philosophical underpinnings of study and the theories that the study was built upon. It also looked the system of healthcare waste management in Ghana relative to the Ministry of Health Guidelines.

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CHAPTER FOUR

DEMOGRAPHIC CHARACTERISTICS AND KNOWLEDGE, ATTITUDE AND PRACTICES OF HEALTHCARE WASTE MANAGEMENT

4.1 Introduction

The public health risk associated with healthcare waste management depends on how healthcare personnel handle healthcare waste in health facilities. Hence, this chapter presents the result of the analysis of data on the knowledge, attitude and practices of healthcare personnel with regards to healthcare waste management in healthcare facilities in the Ho Municipality.

4.2 Background Characteristics of the Respondents and the healthcare facilities

A total of eight healthcare facilities were surveyed in the study. These were the Ho Regional Hospital, Four District Hospitals, One Health Centre, a Clinic, and a CHPS compound. The relative proportion of health personnel from the various health facilities is presented in Figure 4.1.

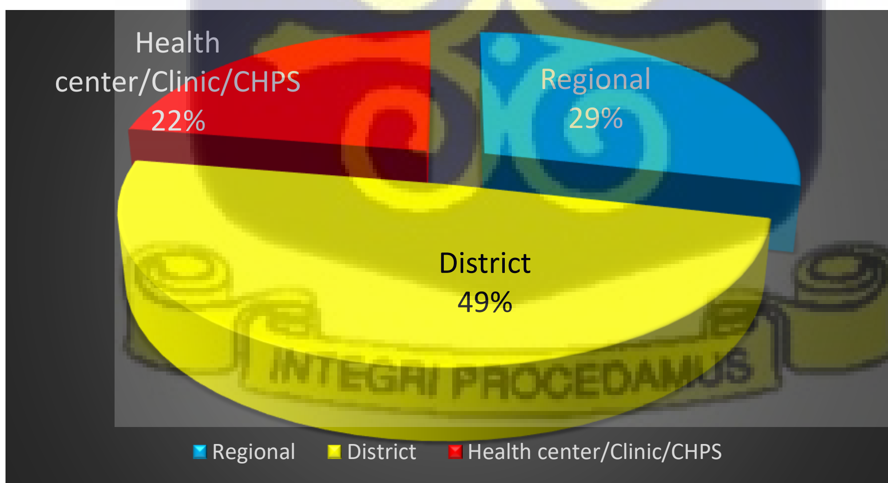

Figure 4.1: Categories of the healthcare facilities

Source: Field work, 2016

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Table 4.1: Demographic Characteristics of Respondents

Characteristic	Frequency	Percentage
Sex		
Male	50	30.00
Female	115	70.00
Total	**165**	**100.0**
Level of Education		
Basic	16	10.00
Secondary	32	19.00
Tertiary	117	71.00
Total	**165**	**100.0**
Profession		
Doctors and Physician Assistants	16	0.10
Nurse	90	0.55
Laboratory Technician	16	0.10
Waste worker	28	0.17
Supporting Staff	15	0.09
Total	**165**	**100.0**

Source: Field Work, 2016

In all 20% of the healthcare facilities were private owned whereas 80% were state owned. Also, a total of 165 respondents from the various categories of healthcare facilities participated in the study. The result in Figure 4.1 shows that 49% of the health personnel work in a district hospital, 29% work in a regional hospital whiles 22% work in a health centres, clinics or CHIPS compound. The background characteristics of the respondents are presented in Table 4.1.

From table 4.1, it can be deduced that majority of the respondents were females. The reason being that majority of health workers are nurses and the nursing profession is dominated by women. In terms of highest level of education, 71 % of the health workers had completed tertiary education. The result additionally depicts that more than half (54.5 %) of the health workers were Nurses whereas 17 % were waste workers. Again

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10% of the health workers were Medical Doctors or Physician Assistants. With regards to level of education, table 4.1 depicts that more than half of the study participants had tertiary education representing 71 percent whilst 19 percent and 10 percent represents both secondary education and basic education respectively.

4.3 Training in healthcare waste Management

Table 4.2: Share of personnel receipt of training or no training in HCWM

Profession	Received training		No training	
	N	**%**	**N**	**%**
Doctors & Physician Assistants	10	62.5	6	37.5
Nurses	41	45.6	49	54.4
Waste workers	14	50.0	14	50.0
Others	14	45.2	17	54.8
Total	**79**	**47.9**	**86**	**52.1**

(χ^2 = 9.080; Degrees of Freedom = 4; p = 0.059

Source: Field work, 2016

The healthcare workers were asked whether they had ever received training in healthcare waste management**.** In this section, the healthcare workers were categorized into four: medical doctors and physician assistants, were in one category. The other categories were Nurses, Waste workers and other supporting staff including laboratory Technicians, health assistants' etcetera. Table 4.2 shows that majority (62.5%) of medical doctors and physician assistance in the health facilities received training in healthcare waste management compared to minority (45.6%) of the nurses. The result further shows that other health personnel in constituting laboratory scientists, health assistants amongst others who had formal training formed 45.2% percent while those in this category without training in healthcare waste management. constituted 54.8 percent. As depicted in the conceptual framework, the proper or improper healthcare

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waste is a function of whether health personnel received training or not on the management of healthcare waste. Comparatively, the percent of personnel who had received some form training fall short of those who have not received any form of training at all as depicted by 52.1 percent and 47.9 percent respectively. Following from the conceptual framework, this could be a source of healthcare waste mismanagement. Capacity building for healthcare workers of all categories on healthcare waste management will enhance proper and effective waste management practices (Abah and Ohimain, 2011) and minimizes the likelihood of accidental exposure to blood borne pathogens or body liquids (Beltrami et al., 2000). From the survey, the result shows that 48% of the health workers had received some training in healthcare waste management. Similarly, 70% of the laboratory technicians had also been trained in healthcare waste management relative to 50% of the auxiliary staff who indicated that they had received training in healthcare waste management. It can be concluded from the Chi-square test of association that there is no significant association between job category and receiving training in healthcare waste management ($\chi^2 = 9.080$; Degrees of Freedom = 4; $p = 0.059$ at 0.05 significance level).

However, the data revealed that the training that some personnel have had were not basically targeted at waste management but rather on prevention and control of occupational hazards and infection.

Some personnel had this to say- *the kind of training that is usually given, well even if it is even training is that, once in a year the hospital authorities organised a seminar on general occupation and safety issues were questions are asked on general occupational hazards including healthcare waste. So, it is not as if a separate training is organised purposely for healthcare waste management. So, I will say that when it comes to*

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healthcare waste management issues, we learn on the job because while on the job you are then taught or told which waste goes into which waste bin or bag.

The Majority' opinion unifies with a study by Akum (2014), where it was revealed most workers in the facility were not trained to handle waste (Akum, 2014). It also conforms to studies carried out in Nigeria, Uganda and Jordan (Abah and Ohimaain, 2011; Obgonnna et al 2012; Abdulla, Qdais and Rabi, 2008; Wafula, Musiime and Oporia, 2019). Findings of the study revealed that, majority (54 percent) indicated they have had training but concerned about the duration of training- only one year but findings form this current studies had 52.1 being the majority of the respondents not having training on the management of healthcare. The need to have well trained waste workers to handle waste was opined in a study by Akum (2014) where majority of the healthcare facility managers surveyed indicated that having specialized waste workers was very essential to the effective management of healthcare waste. On the contrary, this contradicts a study in Yemen where only 20 percent of healthcare facility managers saw the need to have specialised waste handlers; and further revealed the absence of a formal training programme in the facilities surveyed (Al-Amad 2011). Since a single untrained staff could create a risky environment for all other workers and clientele, it is highly recommended that facilities strive to reach a 100 percent target of all staff being trained. This study also agrees with a study in Libya where greater percentage (53.1percent) of the healthcare workers surveyed did not receive any form of training on healthcare waste management best practices (Azage, 2013). These are expressed in the statements below:

A nurse had this to say, most of us nurses actually receive some sought of training on waste management- handling, segregation and disposal practices whilst in school especially during our rotational periods. So, it is a kind of on the job training. For

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instance, since I officially commenced work in this hospital for the past four years no workshop or in-service training has been organised on the waste management. What usually happens is that every year, an assessment on occupational safety is done through a brief questionnaire and then questions are asked on waste management especially colour coding.

(Sarah)

I was employed a few months ago and having been working in the male ward for the past four months. My duty is to make sure waste generated is taken form the ward to the bigger waste containers outside of the ward. Since I was employed I have not been given any official training on the job but rather learn from my senior colleagues on how to go about my work.

(*Elorm*)

We were four in number who were employed at the same time. After we were given appointment letters, a three-day in-service training was organised to tame us through the several of waste management practices. One major thing that was stressed during this training was colour coding for the various waste types.

(*Charis*)

On my part, the facility did not have any one to do the general cleaning in the facility so the head of the facility approached me and asked me whether I could take up the services in the institution, for which I agreed and started work. I have not been given any training on waste management back rather I learned on the job through a series of questions when not clear on anything.

(*Auntie Amivi*)

In the context of cultural theory, perceptions of people are determined by the grid or group typology. Hence, the perception of shared knowledge received by healthcare personnel is determine by their belonging to one the grid typologies- individualists,

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egalitarian, hierarchical and fatalist (autonomous). Thus, it can be said that the perception of health personnel regarding whether they have had some training on healthcare waste management is determined by which of the grid typologies individual personnel belong to or best describes the individuals and have led to the various percentages.

4.4 Health personnel Level of knowledge on Healthcare Waste Management

The question on the level of healthcare personnel's knowledge in healthcare waste management revealed that a little over 80% of the Medical doctors and Physician Assistants indicated that they had a good knowledge of healthcare waste management practices compared to 35.7 % of the waste workers.

The results further show that a greater proportion of the nurses (68.9 %) had good knowledge of healthcare waste management relative to the waste workers. This corroborates with a study by Akum (2014) in Bawku, where waste workers were of the view that they had very low level of knowledge in healthcare waste management. It was also observed in a survey in Nigeria that, majority of the healthcare workers had little or no knowledge in the management of healthcare waste, which was mostly through their inability to identify the types of waste generated (Ogbonna et al, 2012).

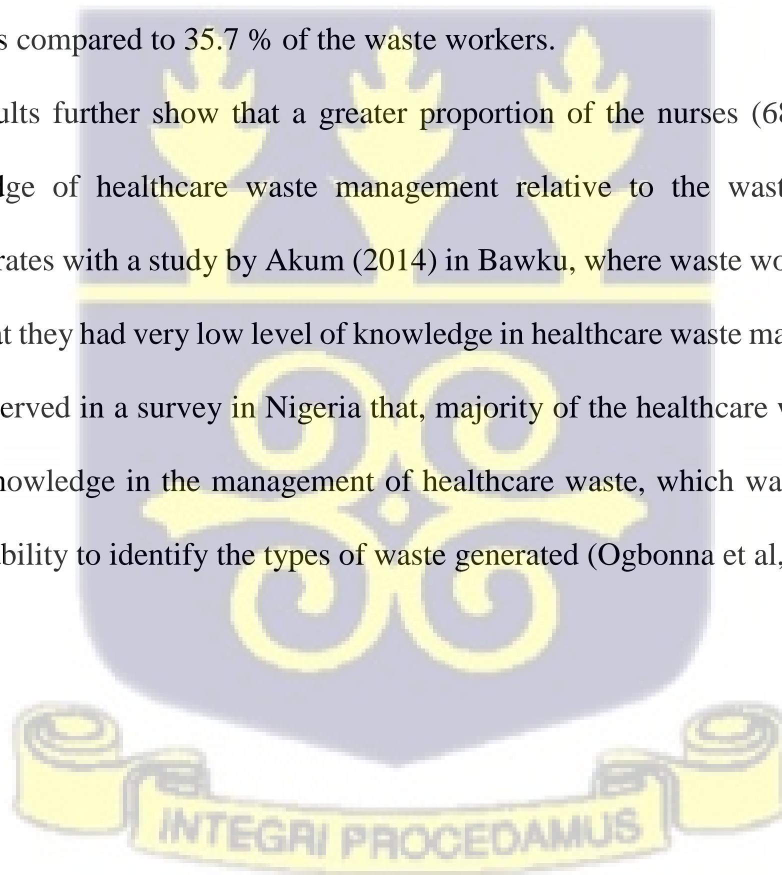

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Table 4.3: Job category and Level of Knowledge of HCW Management

Level Knowledge of healthcare waste management				
Job Category	Good		Poor	
Doctors & Physician Assistants	13	81.3	3	18.2
Nurses	62	68.9	28	31.1
Waste workers	10	35.7	18	64.3
Others	21	60.0	10	40.0
Total	**106**	**64.2**	**59**	**35.8**

(χ^2 = 13.704; Degrees of Freedom = 4; p = 0.008)

Source: Fieldwork, 2016

This is confirmed by a baseline study in Uganda where it was revealed that majority of healthcare workers did not have much knowledge in the identification of different categories of waste produced, but this was a significant improvement in the end line study in 2013 of the same 50 facilities that took part in the baseline survey (AIDSTAR, 2014). A survey conducted in Yemen main hospitals showed that, a small percentage of waste workers 11.5 % and 45.9 % in both public and private hospitals respectively were able to identify waste categories that they were collected, attributable to lack of training (Al-Amad, 2011). This implies knowledge regarding waste management was better in privately owned hospitals compared to the state-owned ones. In another survey it was revealed that a limited percentage (33%) of waste handlers could identify the waste types they collected and other healthcare staff' level of knowledge in healthcare waste management practices was limited (Akum, 2014). Therefore, the low level of knowledge in waste management practice could be attributable to lack of adequate training in waste management practices. With reference to table 4.3, the Chi-square test of association depicts a significant association between a health worker's profession and level of knowledge of healthcare waste management (χ^2 = 13.704; Degrees of

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Freedom = 4; p = 0.008 at 0.05 significance level). In other words, ones' profession as a health worker affects ones' level of knowledge of healthcare waste management.

On my part as the senior orderly I was part of a team that took part in a training of trainer's workshop on the management of healthcare waste. Even though we were expected to train our colleague orderlies or waste workers on our return, the hospital authorities have not organised this in-service training for the waste workers. The unfortunate thing is, any time I raised the issue the only response I get is ''no funds available'' so they learn on the job (Sefenya, Regional hospital).

The results in Table 4.4 depicts the result of a binary logistic regression to estimate the effect of sociodemographic variables such as sex, education, profession, facility type and years of service on health workers' level of knowledge on healthcare waste management. The Nagelkerke R^2 value of 0.75 suggests that the model correctly predicts 75 percent of variance in the outcome variable and the Hosmer and Lemeshow test which is significant at 5% level of significance depicts that these sets of designated predictor variables better predict respondents' level of knowledge on healthcare waste management

Table 4.4: Summary results of binary logistic regression coefficients estimating the effect of predictors such as sex, education, profession, facility type and years of service on health workers' level of knowledge on healthcare waste management.

Table 4.4. Effects of Predictors or Demographics on Knowledge in HCWM

Predictors	**β**	**S.E.**	**Wald**	**Exp(β)**	**95% C.I. for EXP(β)**	
					Lower	**Upper**
Sex						
Male (RC)				1.00		
Female	***1.521***	***.377*****	***16.247***	***4.576***	***2.184***	***9.588***
Level of education						
Basic	***-1.061***	***.487***	***4.746***	***.346***	***.133***	***.899***

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Secondary	-.642	.548	1.371	.526	.180	1.541
Tertiary (RC)				1.00		
Profession						
Doctors and physician assistants (RC)				1.00		
Nurse	-.042	.413	.010	.959	.426	2.156
Laboratory Technician	1.325	.848	2.438	3.761	.713	19.833
Waste Worker	21.563	9050.678	.000	2314638.2	0.000	
Supporting staff						
Type of facility						
Private (RC)				1.00		
Public	1.936	.483	16.030	6.928	2.686	17.868
Faith-based	-.782	.596	1.481	0.457	0.127	13.24
Quasi-government	-1.23	.523	3.452	0.29	0.08	9.23
Number of years of service						
Less than 5 ***(RC)***				1.000		
5 or more	***1.338***	***.389*****	***11.813***	***3.811***	***1.777***	***8.174***

Note: Note: R2 =0.75 (Nagelkerke); Cox & Snell) = 0.54, χ= 28.02, df (7), p<0.05 (Hosmer & Lemeshow), Goodness-of-Fit $\chi2$ (8) = 17.93, p=0.02; -2 Log Likelihood = 227.214; $\chi2$ (12) = 96.69, p=0.0001 (Omnibus test of model coefficient), ****p<.01, *p<0.05. Outcome variable: Level of knowledge about healthcare waste management (1=good, 0=poor)**

Additionally, the Omnibus test of model coefficient computed rejects the null hypothesis that suggests that the model is not a significant fit of the data ($\chi2$=96.686, p=0.0001<0.05). Correspondingly, the general predictive accuracy of the model is 80.0 percent. In terms of the predictor variables selected, only sex (p<0.05), and years of service were the only significant predictors of good knowledge about healthcare waste management.

The results show that the likelihood of having good knowledge about healthcare waste management increases among female health workers than males (β=1.521, p<0.05). For instance, females are about 5 times more likely to have good knowledge about healthcare waste management than males than males (OR=4.576, CI=2.18-9.59). Females are likely not to engage in risky behaviours and adhere to safety protocols,

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thus it is not surprising that females are more likely to have good knowledge about healthcare waste management.

Regarding years of service, it is again not surprising that respondents with high years of service had good knowledge about healthcare waste management. The results show that respondents with 5 or more years of service were 4 times more likely to have good knowledge about healthcare waste management than those with less than 5 years' work of experience. According to cultural theory, groups goals affect the way someone sees a phenomenon. Thus, the perception of knowledge relative to the sex of respondents can be noted to implicit underpinned by the hypothesis of cultural differences herein male and female and how issues are perceived.

4.5 Training in healthcare waste Management by facility size

The study as shown in Table 4.5, that 36.2% of health workers from the regional hospital had received training in healthcare waste management compared to 55.6% of those from the district hospital and 45.9% from the smaller health facilities like the centres, clinics and CHPS compounds.

Table 4.5: Training in healthcare waste management and facility size

Training on healthcare waste management				
Facility Size	**Yes**		**No**	
Regional	17	36.2	30	63.8
District	45	55.6	36	44.4
Health Centre/Clinic/CHPS	17	45.9	20	54.1
Total	**79**	**47.9**	**86**	**52.1**

Source: Field work, 2016.

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4.6 Healthcare Waste Management Practices

Questions on healthcare waste management practices included recapping of needles, sealing waste bags at the appropriate time, waste segregation and sorting healthcare waste disposal. The results pertaining to these specific practices afore mentioned are discussed in the following subsections.

4.6.1 Recapping Needles

In response to the question: “do you recap needles before disposal?” the results show that 21% of the orderlies’ recap needles compared to 40% of the nurses. The results further show that 56.3% of the Laboratory Technicians recap needles compared to 50% of the Medical Doctors and physician assistants’ category. Generally, approximately 41 % of the healthcare workers recap needles. During the in-depth interviews, some of the health workers provided some insight into why some of the health workers do not recap needles. According to the ministry of health guidelines on the management of healthcare waste, personnel are not to recap needles after they have been used. However, findings of this study have revealed the practice of recapping of needles or syringes representing 40 percent for nurses, and 57.1 percent for other staff such as laboratory scientist. This will serve as a major source of needle stick injuries among personnel and as echoed by Pruss et al., (1999).

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Table 4.6: Job category and the practice of recapping needles before disposal

	Recapping needles before disposal			
Job Category	Yes		No	
	N	**%**	**N**	**%**
Doctors & Physician Assistants	1	50.0	15	90.0
Nurses	36	40.0	54	60.0
Waste workers	7	21.4	22	78.6
Others	17	57.1	13	42.9
Total	**61**	**37.0**	**104**	**63.0**

χ^2 = 8.060; Degrees of Freedom = 4; p = 0.089

Source: Field work, 2016.

Here are excerpts of what a female nurse at the Ho Regional Hospital had to say:

> *"I think some of our colleagues do recap needles as a result of forgetfulness. They do it unconsciously because you see we are attending to a lot of patients. The pressure alone makes us forget to do some of these little things".*
>
> *(Abena)*
>
> *During the direct observation sections, the researcher actually saw some nurses after using syringes actually putting them in black bin liners or bags meant for general waste.*
>
> *(Muftao)*

The Chi-square test of association depicts a no significant association between Job category and the practice of recapping needles in the health facilities (χ^2 = 8.060; Degrees of Freedom = 4; p = 0.089 at 0.05 significance level).

From table 4.6, the analysis of the association between facility size and the practice of recapping needles shows that nearly 35% of the regional hospitals recap needles before

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disposal compared to about 52% of the district hospitals who do same. The result also shows that more than 70% of the health centres, clinics and CHPS compounds do not recap needles before disposal.

Table 4.6: Facility size and the practice of recapping needles

Recapping needles before disposal				
Facility Size	**Yes**		**No**	
	N	**%**	**N**	**%**
Regional	16	34.8	30	65.2
District	42	51.9	39	48.1
Health Centre/Clinic/CHPS	9	24.3	28	75.7
Total	**67**	**40.9**	**97**	**59.1**

χ^2 = 15.659; Degrees of Freedom = 6; p = 0.016

Source: Field study, 2016.

It can be concluded from the Chi-square test of association that a significant association between health facility size and the practice of recapping needles before disposal (χ^2 = 8.940; Degrees of Freedom = 2; p = 0.011 at 0.05 significance level). In other words, the practice of recapping needles in the health facilities is influenced by how big or small the facility is. Following from the conceptual framework and cultural theory, the size of facilities are cultural variables or indicators in this case that have influenced the practice of recapping of needles. The high occurrence in the more advanced facilities could be attributable to number of patients attended to on daily basis.

4.6.2 Sealing waste bags at the appropriate time

In response to the question: "at what point do you seal waste bags?" the result as presented in Table 4.7 shows that nearly 28% of the regional hospital workers seal waste bags at all points in time. For the district hospitals, 11% seal waste bags compared

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to 2.7% in the health centres, clinics and CHPS compounds. Results further indicated that there more likelihood for personnel in the teaching hospital and health centres and clinics to seal when three-quarters full than the district hospital in the study area.

Table 4.7: Health Facility size and when waste bags are sealed

	At what point or level are waste bags are sealed?							
Facility size	When full		When half full		When $^3/_4$ full		At any point	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Regional	1	2.1	8	17.0	25	53.2	13	27.7
District	9	11.1	23	28.4	40	49.4	9	11.1
Health Centre/Clinic/CHPS	4	10.8	12	32.4	20	54.1	1	2.7
Total	**14**	**8.5**	**43**	**26.1**	**85**	**51.5**	**23**	**13.9**

χ^2 = 15.659; Degrees of Freedom = 6; p = 0.016
Source: Field work, 2016

To ensure the safety of staff and waste handlers, bins or bin liners containing waste should be sealed at the appropriate point. From the survey, it was observed that most respondents knew the point at which, waste bins or bin liners are supposed to be sealed. This is in-line with MOH guidelines that, waste bins or bin liners must be sealed when three-quarters full (MOH, 2006). This would prevent sharp instruments from exposure and lessen the risks associated with its disposal. Even though majority's indication conforms with MOH guidelines, a look at the percentages that are not aware of the point at which waste bins or bin liners should be sealed should still be a matter of great concern to authorities, as this could stem from lack of training and knowledge as well as source of injuries especially regarding sharps.

The Chi-square test of association between facility sizes and when waste bags are sealed depicts a significant association between the size of a health facility and when healthcare waste bags are sealed. The result implies that the size of a health facility

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affects when healthcare waste bags are sealed ($\chi^2 = 15.659$; Degrees of Freedom = 6; p = 0.016 at 0.05 significance level). During the field observation, it was realized that, in all the facilities waste bin liners were actually sealed at any point in time. This practice does not conform to policy guidelines states that bin liners should be sealed when three-quarters full. Thus, even though the results show a good indication of the practice, during the field observation the standard practice of sealing waste bin liners when three-quarters full was not put in place. This could be a source of injury to waste workers especially. Most respondents indicated that waste bin liners are not sealed at the recommended stage and this is captured in the statements below:

Even though the right stage for waste bin liners to sealed is when they are three-quarters full, this is not a common practice as the liners are usually full to capacity before we carry them away. This happens because these bin liners are mostly carried away by we the orderlies the next morning, so by the time we report to work they are fully to capacity. There are not tags for the sealing of the waste bin liners even if we realise they are three-quarters full.

Ericania

Sealing of waste bags or bin liners when three- quarters in actually not followed or practice to the latter. In most cases by the time we come, the bin liners are full to capacity. Even though in some cases we do seal the bags but not specifically when three-quarters full but when we routinely transferrin waste from the smaller bins to larger ones. Even in such a case, the right sealing tag or band is not available so we use any material to help us seal them before the wastes are carried away by zoomlion to external disposal site.

(Alhassan)

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4.6.3 Waste segregation

A good segregation system would ensure a significant decrease in the quantity of healthcare waste especially hazardous waste as it is expensive to manage. The absence of waste segregation undermines the correct estimation of various waste categories. Nonetheless it serves as a useful guide for the valuation of different streams of waste generated with a fair proportion being hazardous requiring special handling in order to avoid negative health consequences (Abah and Ohimain, 2011).

Generally, the result shows that more than 70 % of the health facilities segregate waste before disposal. The relative proportions of the Regional, District and Health centres/Clinics/CHPS compounds facilities that segregate waste before disposal are 72.3 %, 71.6 % and 83.8 respectively. Hence, the chi-square test depicts that there is no significant association between the size of the health facilities and whether waste is segregated or not (χ^2 = 2.154; Degrees of Freedom = 2; p = 0.341 at 0.05 significance level). This result suggests that healthcare waste is segregated in the various health facilities regardless of their sizes.

Table 4.8: Facility size and waste segregation

	Is waste segregated?			
Facility size	Yes		No	
	N	**%**	**N**	**%**
Regional	34	72.3	13	27.7
District	58	71.6	23	28.4
Health Centre/Clinic/CHPS	31	83.8	6	16.2
Total	**123**	**74.5**	**42**	**25.5**

χ^2 = 2.154; Degrees of Freedom = 2; p = 0.341

Source: Field work, 2016

Waste segregation cannot be said to be done very well in this facility. This is because every day both general waste and infections waste are mixed together. One common practice is the mixing of sharps with blood stained cotton in safety sharp boxes and the

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putting pf these blood-stained cotton in bins meant general waste. Moreover, there have been instances where bin liners meant for general waste are used for infectious.

'As you can see for yourself here at the incinerator we do not necessarily separate the waste, the waste that are brought to the incinerator are not well segregated- all the wastes are put together'. (Allu, Laboratory Technician, Ho)

Mostly waste is segregated in the various wards and other departments. Even with this, you can still see a couple of infectious waste mixed with general waste. What is of much concern to me and should be a matter for the authorities is the mixing up of waste and in the bigger waste bins outside the wards before transportation to the incinerator or external disposal site.

(Azong)

In the context of the theory planned behaviour and through cognitive perspective in explicating segregation practices, the behaviour of personnel is controlled by beliefs and attitudes. The theory of planned behaviour posits that the main predictor of behaviour in the intention to act under volitional behaviour. In view to this, whether healthcare waste is segregated or not by personnel is determined and controlled by volitional intentions which is predicted by the person's attitude and norms of subjectivity and perceived controls. So, personnel who segregate waste have the intention and actually make-up their minds to do so. This has translated into the build-up of the attitude of making sure they put waste in the right colour-coded bins. Consequently, facilities that segregate waste in the context of cultural say district hospitals as found by this study depended on the grip-group typology of the cultural theory. Since group norms are reflects group actions and inactions, the grid typology explains why some healthcare facilities effectively segregate waste and others do not.

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4.6.4 On-site Segregation before Collection

In response to the question "Do you sort healthcare waste before collection?" the result shows that more than half (59.4%) of the facilities sort hospital waste before collection regardless of the facility size. Accordingly, the chi-square result of association depicts that a no significant association between the size of the health facilities and whether healthcare waste is sorted on site before collection or not (χ^2 = 1.821; Degrees of Freedom = 2; p = 0.420 at 0.05 significance level). This result suggests that healthcare waste is segregated in the various health facilities regardless of the relative sizes of the facilities. In other words, the size of a facility does not influence the practice of waste segregation. The result is presented in Table 4.8.

Table 4.9: Facility size and on-site waste sorting

Is healthcare waste sorted on site before collection?				
Facility size	**Yes**		**No**	
Regional	31	66.0	16	34.0
District	44	54.3	37	45.7
Health Centre/Clinic/CHPS	23	62.2	14	37.8
Total	**98**	**59.4**	**67**	**40.6**

χ^2 = 1.821; Degrees of Freedom = 2; p = 0.420

Source: Fieldwork, 2016

4.6.5 Application of Recommended Colour Coding

All the respondents from the various health facilities during the survey indicated that the health facilities in which they work use the recommended colour coding for waste segregation. It was observed that the use of appropriate colour coded bins and bin liners were in place in all the public health facilities regardless of facility size except in the private facilities. However, the danger with this system is that visitors to the facilities and out patients are likely to dispose of waste of any type of bin due to convenience.

This is what a nurse at health facility had to say in an interview:

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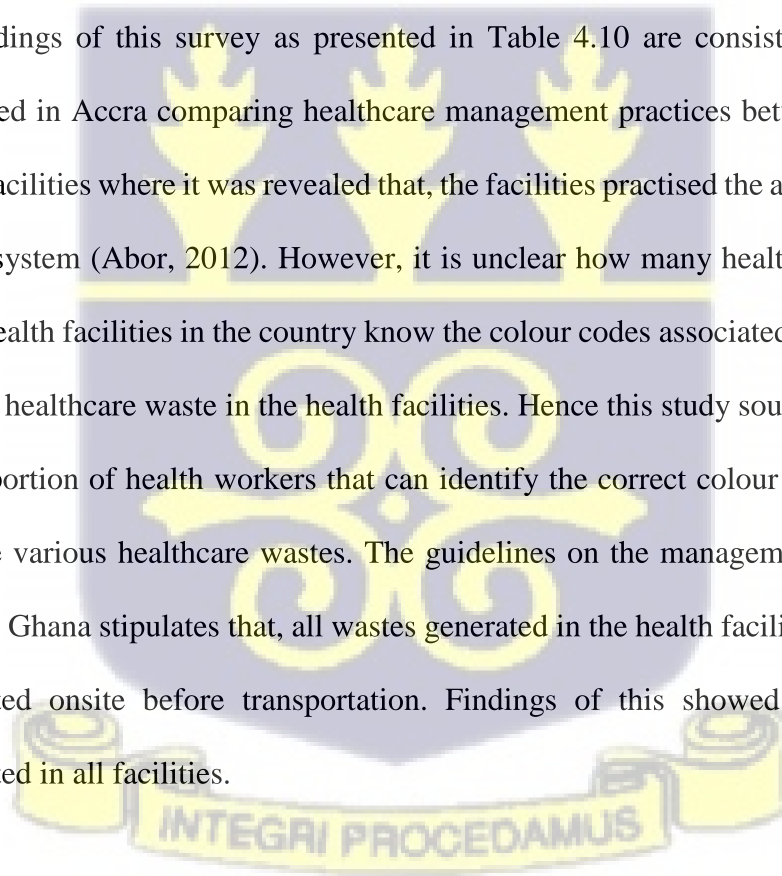
'In this hospital waste bin for the collection and disposal of healthcare waste does not follow any colour coding system. After the wastes are put in smaller bins which are not colour coded, it is then transferred to a bigger bin by the waste worker. This bigger bin is of any colour ranging from black, blue, white and yellow all kinds of wastes are put inside'. it is most unfortunate this is the case and for now the appropriate authorities are doing nothing about it. Well we have complained a couple to times and we were told the situation will be dealt with or solved appropriately.

(Jelin)



The findings of this survey as presented in Table 4.10 are consistent with a study conducted in Accra comparing healthcare management practices between private and public facilities where it was revealed that, the facilities practised the appropriate colour coding system (Abor, 2012). However, it is unclear how many health workers across major health facilities in the country know the colour codes associated with the various types of healthcare waste in the health facilities. Hence this study sought to investigate the proportion of health workers that can identify the correct colour codes associated with the various healthcare wastes. The guidelines on the management of healthcare waste in Ghana stipulates that, all wastes generated in the health facilities must be duly segregated onsite before transportation. Findings of this showed that waste was segregated in all facilities.

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Table 4.10: knowledge about Healthcare Waste Colour Codes

Type of Health Waste	Knowledge on correct colour coding	Percentage
General Waste	165	100.0
Sharps	79	48.00
Patient Waste	83	50.30
Pharmaceutical Waste	118	71.50
Laboratory Waste	109	66.00

Source: Fieldwork, 2016

The results show that all (100%) the respondents knew the correct colour code associated with General waste. However, only (48%) of them knew the correct colour code used to identify the waste bin in which sharps are kept. The result further shows that approximately half (50.3%) of health workers knew the colour code associated with Patient waste. For pharmaceutical waste, the result shows that more than 70% of the health workers knew the correct colour code used to identify the refuse bin in which waste is stored. It is clear that majority of health workers in the municipality are knowledgeable about waste segregation in accordance to the colours of their bins. In some facilities as shown in Figures 4.3 and 4.4, bins were boldly labelled even though the colours could differentiate.

The identification of some waste category is difficult because some of the waste are produced in specific departments which are dealt with separately and we are not ***privy*** *to them. Mostly the colour codes are easily identified by the workers who use them for segregation and disposal.*

(Elsie)

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Plate 1: Colour code used to segregate healthcare waste in a District Hospital

Source: Field work, 2016

Plate 4.2: Healthcare waste segregation in a Regional Hospital by colour codes

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Source: Field work, 2016

Even the authorities know the right colour codes for bins and bin liners for the segregation of waste, what is been provided at this facility is blue which is not the standard practice. (Jil)

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4.7 Awareness of Healthcare Waste Management Plan

Having a waste management plan in a healthcare facility aids in ensuring that waste is handled appropriately with regards to generation, segregation, treatment, disposal and final disposal. Hence the health workers were asked whether they are aware of any waste management plan instituted by their respective health facilities. Figure 4.6. presents the result.

Figure 4.2: Awareness of Healthcare Waste Management Plan
Source: Fieldwork, 2016

The results show that majority (75%) of the respondents were not aware of any waste management plan in their facilities whilst 25% indicated that they were aware of a waste management plan in the facilities they work in. The non-existent of a healthcare waste management plan in healthcare facilities would imply that waste is being managed anyhow and this could be a source of risks to healthcare workers and the general public. A study in Nigeria also revealed non-existence of healthcare waste management plan in most health facilities (Ngwuluka et al., 2009). Consequently, the authors recommended the constitution of a healthcare waste management team to prepare healthcare waste management plan, policy documents and technical guidelines and in addition supervise waste management activities in healthcare facilities (Ngwuluka et al., 2009). A study conducted in Madagascar of 17 Healthcare Facilities also revealed

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that 60% of healthcare facilities had not implemented a Healthcare Waste Management Plan that validated by the Ministry of Health of Madagascar (Odette et al, 2014). The technical guidelines on the management of healthcare waste instituted by the Ministry of Health- Ghana, charges all health facilities whether public or private to have waste management plans in the respective facilities. However, the findings of this research have shown that, all the health facilities that took part in this survey have gone contrary to this mandate as non-has instituted waste management plans in their facilities.

We are not aware of any waste management plan in this facility neither have we been taken through it with regards to waste management in this facility. If there is anything plan on the waste management then it is known to only the authorities. But I think if there is a waste management plan then all involved in making sure waste is properly managed is must be aware of it and visible in the various departments. This will ensure effective management process.

(Vanessa)

4.7.1 Healthcare Waste Management Plan awareness

In order to ascertain the association between awareness of healthcare waste management plan and health personnel, a cross tabulation and chi-square test of association was carried out at a significance level of 5%. The result as presented in *Table 4.11.* shows that there is a significant association between the job category of the health personnel and awareness of health waste management plan in the various health facilities (χ^2 = 17.785; Degrees of Freedom = 4; p = 0.023). In other words, a health worker's job category can influence his or her awareness of a healthcare management plan in a health facility in the Ho Municipality.

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Table 4.11: Awareness of HCWM Plan and Job Category

Job Category	Yes		No	
	N	%	N	%
Doctors & Physician Assistants	3	18.8	13	81.2
Nurses	30	33.3	60	66.7
Laboratory Technicians	5	31.2	11	68.8
Waste workers	2	7.1	26	92.9
Others	2	13.3	13	86.7
Total	**42**	**25.5**	**123**	**74.5**

χ^2 = 17.785; Degrees of Freedom = 4; p = 0.023

Source: Fieldwork, 2016

4.7.2 A Cross Tabulation of Awareness of HCWM Plan and Health Facility

Table 4.12 shows the result of the cross tabulation between awareness of a healthcare waste management plan and health facility. The result reveals that nearly 30% of the respondents from the regional hospital and another 30% of respondents from Health centres/Clinics/CHPS compounds indicated that they were aware of a healthcare waste management plan in their health facilities. Hence the chi-square test showed no significant association between the health facility a respondent works for and his or her awareness of health waste management plan in the health facilities (χ^2 = 1.673; Degrees of Freedom = 2; p = 0.433).

Table 4.12: Awareness of HCWM Plan and Health Facility

Facility size	Yes		No	
	N	%	N	%
Regional	14	29.8	33	70.2
District	17	21.0	64	79.0
Health Centre/Clinic/CHPS	11	29.7	26	70.3
Total	**42**	**25.5**	**123**	**74.5**

χ^2 = 1.673; Degrees of Freedom = 2; p = 0.433

Source: Fieldwork, 2016.

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4.8 Awareness of MOH Policy Guidelines for Health Institutions

The existence of regulatory frameworks and manuals on healthcare waste management is a way of ensuring the proper management of healthcare waste. The awareness of any policy document by healthcare professionals on the management of the waste they produced would go a long way to ensure the effective and efficient way of waste management thereby helping to reduce the health risks that are associated with it. The study thus sought to unearth the knowledge of healthcare professionals on their awareness of the Ministry of Health Policy document on directions and methods pertaining to the management of healthcare waste in the country, which the total handling of healthcare waste in facilities of health provision must conform to.

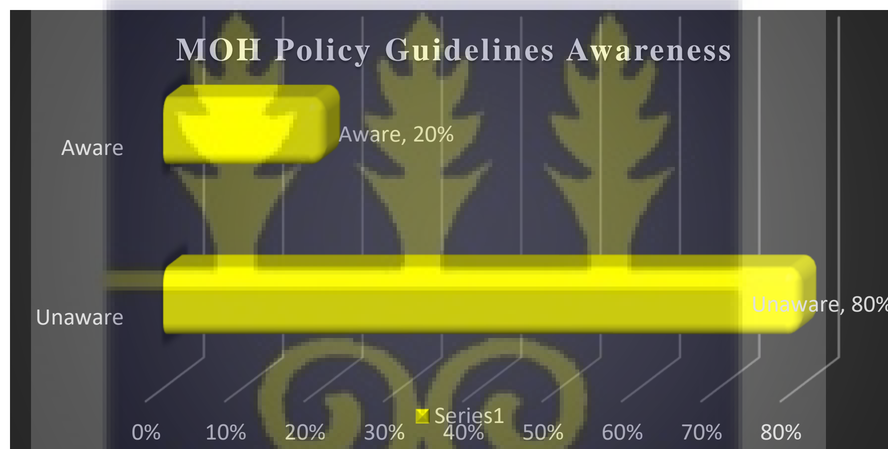

Figure 4.3: Awareness of MOH Guidelines on Healthcare Waste Management
Source: Field work, 2016.

The results indicate that an overwhelming majority (80%) of the healthcare professionals who took part in the survey were not aware of the MOH Policy Guidelines on the management of healthcare waste. This result is consistent with a study conducted in Libya where only 20% of respondents knew about a WHO manual on the management of healthcare waste in the country (Muluken et al., 2013).

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4.9. Chapter Synopsis and Conclusion

The chapter highlighted the findings of the study but focused on the first two objectives. First and foremost, it discussed the demographic characteristics of the study respondents by looking at the variables like age, sex, education. The discussion continued with findings on the knowledge, attitude and practices of healthcare personnel with regards to healthcare waste management practices in healthcare facilities in the Ho Municipality.

The primary issues of medical waste management in Ho Municipal are presented in this study from the perspective of healthcare personnel. A major source of worry is healthcare professionals' failure to follow the guidelines' healthcare waste management rules. Healthcare waste management guideline documents are not obtainable in all of the healthcare facilities surveyed and therefore personnel do not have access to them. To appreciate the healthcare waste management in both government and private health facilities, the knowledge, attitudes, practices and the risk perception of healthcare personnel were assessed and these were based and influenced by the demographic characteristics such as education, age, sex, and job category among others. In terms of overall training, majority of respondents (52.1 percent) in this study claimed not to have received formal training in healthcare waste management, compared to only 47.9 percent who indicated having received training. This is not in consonance with a study conducted in South Africa (Govender, Olaifa and Ross, 2018). However, majority of the health personnel specified that there was no specific time schedule for regular training in the various facilities. Accordingly, the lack of consistent training, a good number of health personnel are typically not familiar with even the categories of waste (Wafula, 2019; Makhura et al., 2016). It is impossible to anticipate proper waste segregation at the source without this knowledge. As a result, it is not surprising that

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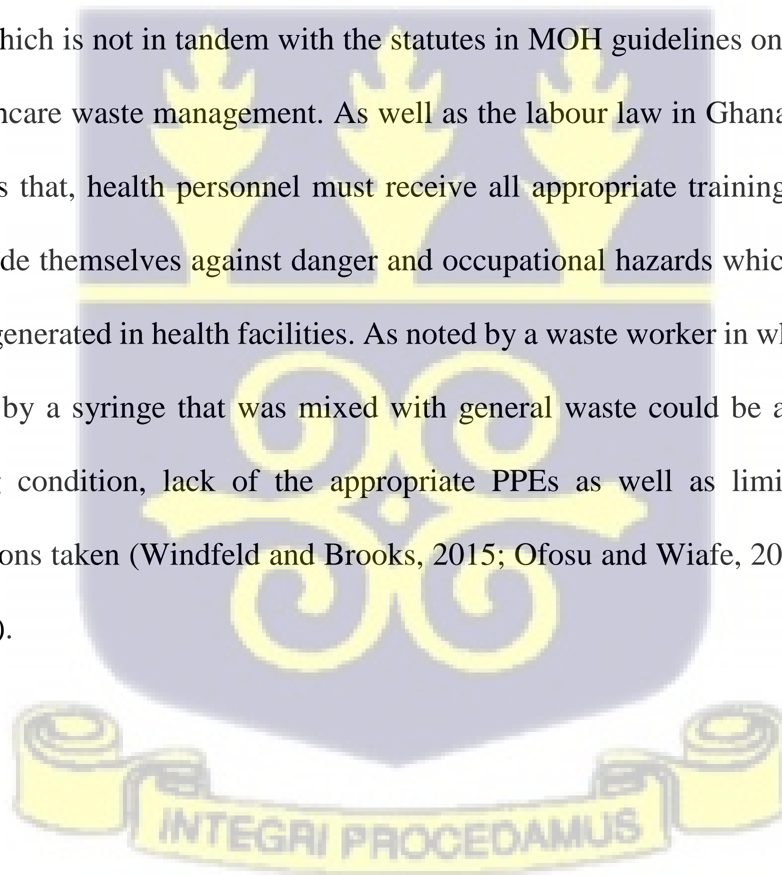
no facility reviewed achieved 100 percent appropriate healthcare waste segregation. Poor segregation behaviour among healthcare personnel have also been observed in other investigations (Raphela, 2014; Nemathaga et al., 2008; Asante, Yanful and Yaokumah, 2014). It has been proven that training can help healthcare staff improve their healthcare waste management practices (Wafula et al., 2019; Yenesew et al., 2012; Abanyie et al., 2021). Poor segregation techniques could be the result of inadequate understanding of the many types of healthcare waste. Training was noted by the study to be inadequate and this has been recounted in several studies in Ghana and Africa (Acheampong and Dzodzomenyo, 2016; Amfo-Out, 2018; Amos, Musa and Au-Yong, 2020). Training was not regularly done for workers on the management of healthcare waste which is not in tandem with the statutes in MOH guidelines on the management of healthcare waste management. As well as the labour law in Ghana. The labour law indicates that, health personnel must receive all appropriate training that will ensure they guide themselves against danger and occupational hazards which also stem from wastes generated in health facilities. As noted by a waste worker in which she has been pricked by a syringe that was mixed with general waste could be attributed to poor working condition, lack of the appropriate PPEs as well as limited occupational precautions taken (Windfeld and Brooks, 2015; Ofosu and Wiafe, 2016; Accra-Ghana T, 2016).



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CHAPTER FIVE

RISKS AND RISK PERCEPTIONS

5.1 Introduction

This Chapter presents the relative exposure of the health workers to risk and their perceptions in respect of healthcare waste management in health facilities. The objective was to analyse health workers' perceptions on exposure to risk and perception about the potential health risk associated with healthcare waste. The perceptions were assessed based on a set of questions which responses were assessed using a five-point scale.

5.2 Injuries from sharp objects

Healthcare workers sustain Injuries from sharp objects during their normal activities in connection with patient care (Ibrahim, 2015). Studies have shown that injuries from sharps occur during the use of sharp objects or before disposal of used sharps (Quinn et al., 2009). In this study respondents were asked the question "Have you had any injury from a sharp instrument"? The result is presented in Table 5.1. It can be inferred from the result that waste workers are the most exposed to injury from sharp objects followed by nurses. The result shows that nearly 43% of the waste workers sustained injuries from sharp objects compared to about 38% of the nurses and about 31 % of the laboratory scientists. The result further shows that about 33% of the Medical Doctors sustained injuries from sharp instruments. Some studies have shown that experience and age are two important factors that affect the occurrence of injuries from sharp objects. Experienced health workers and older health workers are more likely to improve their competence in using sharp medical instruments and their waste handling

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practices through time, both of which are important in preventing injury (Alamgir et al., 2008; Quinn et al. 2009).

Table 5.1: Injury from Sharp Instruments

	Yes		No	
	N	%	N	%
Medical Doctors	2	33.3	4	66.7
Nurses	34	37.8	56	62.2
Laboratory Scientists	5	31.2	11	68.8
Waste workers	12	42.9	16	57.1
Others	4	19.2	21	80.8
Total	**57**	**34.5**	**108**	**65.5**

Source: Field work, 2016

5.3 The point at which injury occurred

The respondents were also asked to indicate when they sustained injuries from sharp instruments. They were expected to indicate whether it occurred before, during or after the use of the sharp instrument which caused the injury. The results show that generally most (49.1 %) of the injuries occurred during the use of sharp objects. For instance, in the case of medical doctors all the injuries occurred during the use of sharp objects. In the case of the nurses, more than half (55.9%) of the nurses who were injured by sharp objects sustained the injuries during the use of the sharp objects. The same can be reported of the laboratory scientists. The result showed that 50 % of the laboratory technicians who were injured by sharp instruments sustained the injuries during the use of the sharp instruments. It was not surprising that an overwhelming majority (90 %) of all the waste workers who were injured by sharp instruments sustained the injuries after the sharp instrument was used by other health workers namely doctors, nurses or laboratory technicians.

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Table 5.2: Stages of Injury Occurrence

Job Category	Before use		During use		After use	
	N	%	N	%	N	%
Medical Doctors	0	-	1	100.0	-	-
Nurses	8	23.5	19	55.9	7	20.6
Laboratory Technicians	1	25.0	2	50.0	1	25.0
Waste workers	-	-	1	10.0	9	90.0
Others	-	-	3	75.0	1	25.0
Total	**9**	**17.0**	**26**	**49.1**	**18**	**34.0**

Source: Field work, 2016

5.4 The use of gloves

In order to ascertain the level of exposure to risk of infection from healthcare waste, the respondents were asked to indicate whether they use gloves when handling healthcare waste. The results show that more than 70% of the health workers use gloves always when handling health waste. At the job category level, the result showed that an overwhelming majority (87.5%) of the laboratory technicians used gloves always compared to about 83% of the medical doctors. Surprisingly, nearly 27% of the waste workers indicated that they use gloves sometimes when handling waste in the health facilities.

Table 5.3: Use of Gloves in Handling Health Waste

Do you use gloves when handling health waste?

	Always	Sometimes
	%	%
Medical Doctors	83.3	16.7
Nurses	68.5	31.5
Laboratory Technicians	87.5	12.5
Waste workers	73.1	26.9
Other Health Workers	76.0	24.0
Total	**72.8**	**27.2**

Source: Field work, 2016

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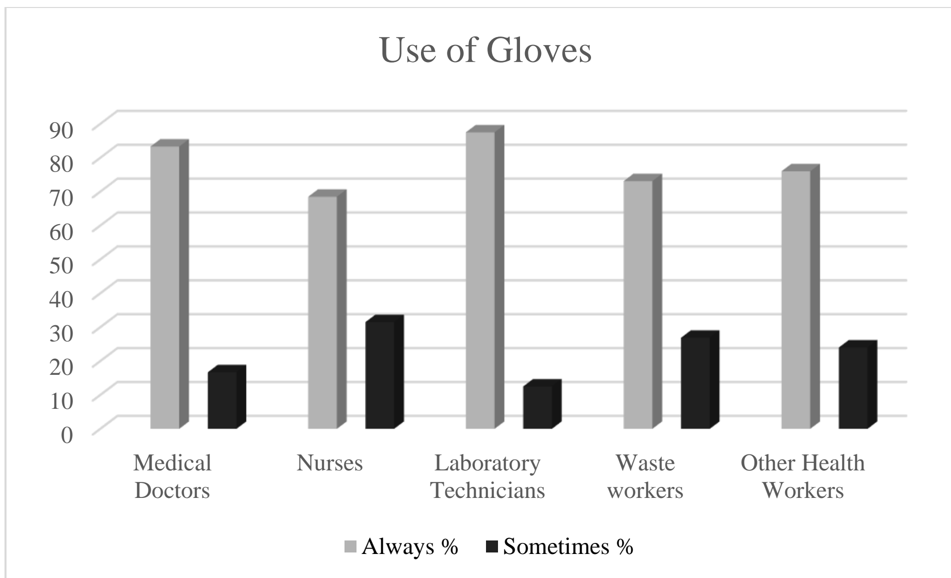

It was quite worrying to see some of the waste workers whose primary responsibility is to transport the waste from the generation to disposal point not wear gloves as they performed their duties. This result is consistent with similar studies in other parts of the world where it has been shown that waste workers do not always wear protective gloves when performing their duties (Patwary et al., 2011; Blenkharn & Odd, 2008, Chowdhury et al. 2011; Lavoie et al., 2010). This suggests that some waste workers had a high-risk exposure to infection in the course of their duties. This result could also provide some insight into why all the sharp instrument injuries sustained by the waste workers occurred after the sharp objects had been used in the health facilities as reported earlier. Figures 5.1 and 5.2 are pictures of waste workers in protective gear whilst handling healthcare waste and without protective hand gloves. In Figure 5.1 the waste worker is handling a bag containing infectious waste without wearing protective gloves whereas Figure 5.2 shows a waste weaker wearing protective hand gloves as well as nose mask in a district hospital in the study area whilst Figure 5.2 also shows a waste worker transporting infectious waste (placentas) without protective hand gloves in the same district hospital.

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Plate 5.1: Waste worker handling infectious healthcare waste from the maternity ward without protective hand gloves

Source: Fieldwork, 2016

Plate 5.2: Waste worker handling healthcare waste with protective hand gloves and mask at a Hospital.
Source: Fieldwork, 2016

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Following from the conceptual framework on the use gloves and in the context of the theory of planned behaviour, it can be explicated that, the use of gloves is underpinned by a personnel's behavioural intention to perform the wearing of gloves to handle waste. With a high behavioural intention there was a high tendency that the action was

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performed. Thus, high behavioural intention to use gloves in handling waste implied that gloves were actually worn before waste was handled. Per this study the use gloves depicted that nurses had the highest behavioural intention because nurses formed the highest percentage of health personnel who used gloves.

5.5 Risk Perceptions

This section discusses the risks perceptions of the health workers on the perceived hazards of healthcare waste. The perceptions of the health workers about the risks associated with healthcare waste was assessed using a three-point Likert scale as low risk, medium risk and high risk. Specifically, health workers' perceptions about health workers' risk and public risk of infection from infectious healthcare waste was assessed on a number of issues.

5.5.1 Health workers' risks perception about infectious healthcare waste

The results as presented in Table 5.1 show that nearly 67% of the Medical doctors rated their risk to infection from health waste as high whereas 10% of the nurses, 25% of the laboratory scientists and 14% of the waste workers rated their risk to infection from health risk as high.

Table 5.4: Health workers' risks perception about infectious healthcare waste

Risk perception of infectious healthcare waste

Job Category	Low risk		Moderate risk		High risk	
	N	%	N	%	N	%
Medical Doctors	1	16.7	1	16.7	4	66.6
Nurses	26	28.9	55	61.1	9	10.0
Laboratory Technicians	5	31.2	7	43.8	4	25.0
Waste workers	10	35.7	14	50.0	4	14.3
Others	12	48.0	10	40.0	3	12.0
Total	**54**	**32.7**	**87**	**52.7**	**24**	**14.5**

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χ^2 = 20.278; Degrees of Freedom = 8; p = 0.009

Source: Fieldwork, 2016

Furthermore, the results show that 61 % of the nurses rated their risk to infection from infectious healthcare waste as Moderate risk whereas about 44% of the laboratory technicians and 50% of the waste workers rated their risk to infection from infectious healthcare waste as Moderate risk. Generally majority (52.7%) of the health workers rated their risk to infection as Moderate risk. Also, the chi-square test of association shows that there is a significant association between the Job category of the health workers and their risk perception about infection from infectious healthcare waste (χ^2 = 20.278; Degrees of Freedom = 8; p = 0.009 at 0.05 significance level). This result suggests that the health workers' risk perception about infection from infectious healthcare waste is influenced by their Job category.

One the tenets of cultural theory, risk perception is influenced by demographics such as sex, age and occupation. Using occupation relative to table 5.4, it is clear that the occupation of the respondents influenced the extent of risk perception. Consequently, there is high risk perception in doctors than nurses, waste worker and to the health personnel. Also, moderate risk perception is higher in nurses than doctors and waste workers while low risk perception is seen to higher in paramedics than nurses and doctors. This goes to the confirm the assertion of the theory that demographics such as occupation affects the away people perceive risk and this is reflected in the chi-square test of association depicting a significant association between job category and risk perception.

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5.5.2 Perception about public exposure to risk from infectious healthcare waste

The results as presented in Table 5.2 show that only 13% of the health workers rated public risk to infection from infectious healthcare waste as high risk. Again, it can be seen from Table 5.2 that more than half (53.6%) of the waste workers rated the public risk to infection from infectious healthcare waste as low risk. However, nearly 67% of the Medical doctors rated public risk to infection from healthcare waste as Moderate risk whereas 50% of the laboratory technicians rated public risk to infection from infectious healthcare waste as Moderate risk.

Table 5.5: Health workers' risk of infection from healthcare waste

Health workers' risk of infection from healthcare waste

Job Category	Low risk	Moderate risk	High risk
	%	%	%
Medical Doctors	33.3	66.7	0.0
Nurses	43.3	44.4	12.2
Laboratory Technicians	31.2	50.0	18.8
Waste workers	53.6	35.7	14.3
Others	40.0	40.0	20.0
Total	**43.0**	**43.6**	**13.3**

Source: Field work, 2016

5.5.3 Perceptions on exposure of waste workers to injuries from needles.

Waste workers are responsible for the transportation of healthcare waste from the generation point to the collection. The results show that generally the health workers were of the view that waste workers at the health facilities are exposed to less risk of needle stick injuries from healthcare waste compared to the other health workers. It can be seen from Table 5.3 that about 50% of the respondents agreed that waste workers are exposed to less risk to needle stick injuries relative to the health workers in the health facilities.

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Consequently, the chi-square test of association shows that Job category has no significant influence on the perception that waste workers are exposed to less risk to needle stick injuries from healthcare waste ($\chi^2 = 4.549$; Degrees of Freedom = 4; p = 0.337 at 0.05 significance level).

Table 5.6: Waste workers' risk of infection from healthcare waste

Waste workers are exposed to less risk to injury from healthcare waste

Job Category	Disagree		Agree	
	N	**%**	**N**	**%**
Medical Doctors	4	66.7	2	33.3
Nurses	48	53.3	42	46.7
Laboratory Technicians	9	56.2	7	43.8
Waste workers	10	35.7	18	64.3
Others	10	40.0	15	60.0
Total	**81**	**49.1**	**84**	**50.9**

Source: Field work, 2016

A waste worker in Ho Regional Hospital had this to say about mixing of waste:

"I have ever been pricked by a needle. It all happened when I was carrying a polythene containing general waste, unaware that there was a needle in the waste. It pricked my leg and blood was oozing out. This is due to the carelessness of some nurses. Some nurses indiscriminately put needles in waste bin liners meant for general waste and unknowing to us; we get injured by these needles. I am not the only one who have had injury through this action of some nurses. In my case I had to stay off work for three months and I was put on anti-retroviral drug for the period I was away. Now I am fine and back to but extremely careful when working in order not to be injured by any sharp instrument".

5.5.4 Perceptions about public exposure to needle stick injuries

The public is exposed to needle stick injuries when healthcare waste is discarded on abandoned sites where the public can access easily. For instance, children are mainly at risk when in contact with healthcare wastes on dump sites. The contact with toxic

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chemicals, such as disinfectants may also cause injuries when they are accessible to the public. The result of the study shows that nearly 69% of the respondents agreed that the public are exposed to less risk to needle stick injuries relative to the health workers in the health facilities from which health waste is generated.

Table 5.7: Health workers' risk of infection from healthcare waste

The public are exposed to less risk to injury from healthcare waste compared to the other health workers

Job Category	Disagree		Agree	
	N	%	N	%
Medical Doctors	4	66.7	2	33.3
Nurses	24	26.7	66	73.3
Laboratory Technicians	5	31.2	11	68.8
Waste workers	10	35.7	18	64.3
Others	9	36.0	16	64.0
Total	**52**	**31.5**	**113**	**68.5**

(χ^2 = 4.878; Degrees of Freedom = 4; p = 0.300 a **Source: Field work, 2016**

Consequently, the chi-square test of association shows that Job category has no significant influence on the perception that the public are exposed to less risk to needle stick injuries from healthcare waste (χ^2 = 4.878; Degrees of Freedom = 4; p = 0.300 at 0.05 significance level). Per the cultural theory risk perception is affected by age, occupation, sex, working experience and other dermographias such as type of healthcare facility. From the cross tabulation, job category has a non-association with risk perception that the public is less exposed to needle stick injuries than health personnel, implying that the public have an equal if not more probability of being pricked by needles from healthcare waste.

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Plate 3: Health waste dumped in an open space at a Regional Hospital
Source: Fieldwork, 2016.

5.5.5 Protective attitude relative to exposure to risk from healthcare waste.

In order to elucidate further the healthcare waste management practices at health facilities, the attitude of the health workers in relation to protection against injury was assessed on a two-point Likert scale that was later reduced into low protective attitude and high protective attitude. The results of this study show that nearly 59% of the health workers rated their protective attitude as high whereas 41% of them rated their protective attitude as low. The results further show that 83% of the Medical doctors rated their protective attitude as high whereas nearly 94% of the laboratory technicians and 58% of the nurses rated their protective attitude as high.

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Table 5.8: Health workers' perception of risk of infection from healthcare waste

Is the public exposed to less risk of injury from healthcare waste than qualified health personnel?

Job Category	Low		High	
	N	%	N	%
Medical Doctors	1	16.7	5	83.3
Nurses	38	42.2	52	57.8
Laboratory Technicians	1	6.2	15	93.8
Waste workers	16	57.1	12	42.9
Other Health Workers	12	48.0	13	52.0
Total	**68**	**41.2**	**97**	**58.8**

(χ^2 =13.011; Degrees of Freedom = 4; p = 0.011

Source: Field work, 2016

It was not surprising that 57 % of the waste workers rated their protective attitude as low. Figure 5.1 shows that some of the waste workers were not well protected against the risk to injury and infection from healthcare waste as they performed their duties. It was observed that in some cases waste workers were not consistent in protecting themselves from exposure to risk of injury or infection some waste workers were seen wearing protective gear on some days and on other days they did not wear any protective gear whilst working on healthcare waste. Additionally, some waste workers only wore gloves during work. Consequently, the chi-square test of association shows that there is a significant association between Job category and the protective attitude of the health workers against the risk to injury and infection from healthcare waste (χ^2 =13.011; Degrees of Freedom = 4; p = 0.011 at 0.05 significance level).

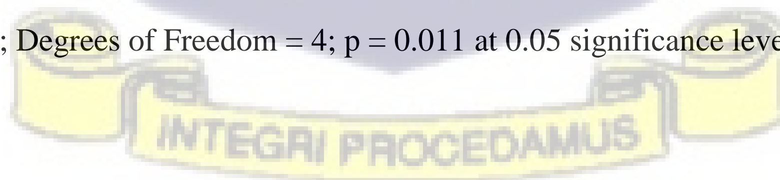

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Plate 4: Waste worker working in the incinerator wearing protective clothing

Source: Field work, 2016

Plate 5: The same waste worker handling waste without a nose mask

Source: Field work, 2016

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5.6 Risk Ratings of Healthcare Wastes

The health workers were asked to rate the risk level associated with exposure to the various healthcare wastes. The health workers were asked to rate the risk levels as Low Risk, Moderate Risk or High Risk.

Table 5.9: Risk Ratings of healthcare wastes (Multiple Ratings)

	Low	Moderate	High
	%	%	%
General Waste	68.5	22.8	8.7
Sharps	16.3	7.6	76.1
Patient Waste	17.7	13.3	69.0
Pharmaceutical Waste	32.5	27.0	40.5
Laboratory Waste	21.1	6.7	72.2

Source: Field work, 2016

The results show that more than half (68.5 %) of the health workers rated general waste as low risk. Also, only 8.7% of the health workers rated general waste as high risk. The estate manager of the Ho municipal hospital had this to say:

> *General waste does not contain infectious waste as compared to other waste that is why generally it is associated with low risk. It consists mostly of food items, plastic bags, cans and tins from both health workers and out patients or visitors at the hospital.*
>
> *(Kumi)*

The result further showed that majority of the health workers rated Sharps, Patient waste and Laboratory wastes as high-risk waste. This is because these wastes can be injurious to humans or carry infections that can be passed on to humans if not handled with care.

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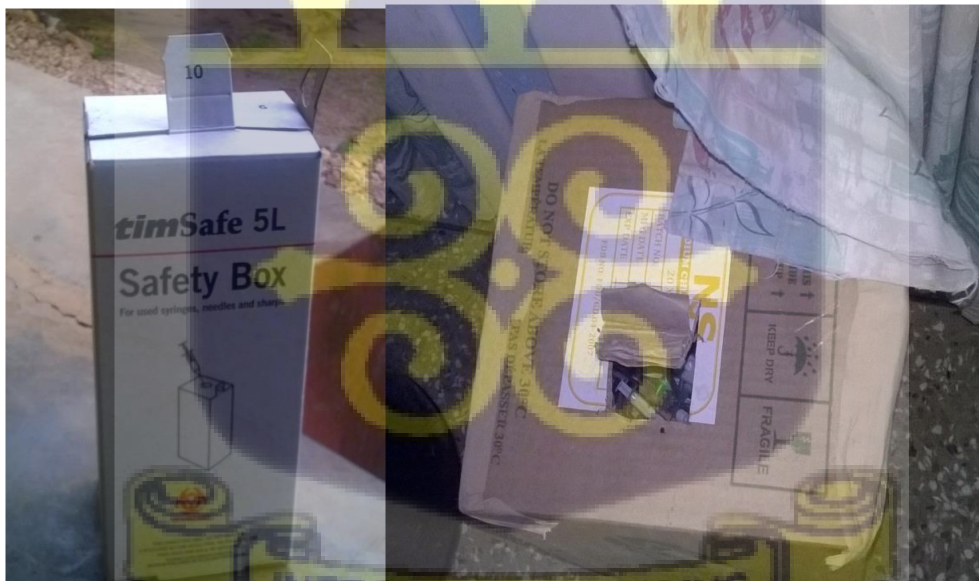
5.7 Challenges associated with Healthcare waste Management

The health workers as well as some selected health facility administrators were asked to mention some of the challenges the management faces when it comes to healthcare waste management in the Municipality. The health workers who participated in the questionnaire survey provided open response to the item question whereas the hospital administrators responded to the question during the in-depth interviews. The responses were coded and have been discussed under the following themes.

5.7.1 Waste bins and sharps containers

Some of the health workers mentioned that the number of waste bins as well as sharps containers for storing used sharps were inadequate. This made waste segregation difficult to practice in the health facilities. Figure 5.6 shows an improvised sharps container.



Safety/Sharp box **Improvised Safety Box**

Plate 6: Safety Box and Improvised Sharps Container

Source: Fieldwork, 2016.

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In this facility the waste bins and waste bin liners are not enough to contain the large amounts of waste generated. Even the sizes of these waste bins are too small too. So, it happens that, in some cases you come and the waste overflows the waste bin and bin liners and spreads on the floor.

(Cleo)

5.7.2 State of Incineration Facilities

It was observed that most private health facilities did not have incineration facilities, whereas the public ones were dysfunctional with the exception of the incinerator at the teaching hospital. For instance, the Municipal Hospital incinerator had been dysfunctional for over two years as the time this study was conducted. Similarly, the incinerator at the teaching hospital had a problem with fuel. A waste worker at the regional hospital lamented:

the initial gas plant that provided fuel for the incinerator had developed a fault, so the we now use firewood as fuel to keep the incinerator functional. This results in the production of smoke that pollutes the surroundings affecting residents who live in the area

(Biggy).

Health administrators were of the view that each health facility needed a modern incineration facility that is energy efficient. Figure 5.7 shows an incinerator releasing smoke into the atmosphere.

A major challenge to waste treatment and final disposal had to do with the breakdown of incinerators within health facilities in the Municipality. At the time of data collection for this study, the only incinerator that was functional was the incinerator at the teaching hospital and even with that too, waste is not properly incinerated because the

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main fuel component was broken down and the facility resorted to the use of firewood to incinerate the waste. Firewood cannot effectively incinerate the waste as expected. At the District hospital the incinerator has broken down for two years and the waste generated there is mostly treated and disposed through burning.

(Notes from field observation)

Plate 7 (a)

Plate 7 (b)

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Plate 7: (a) Broken down incinerator at Ho Municipal Hospital (b) Incinerator at regional hospital releasing Smoke into the atmosphere. Plate 7 (c) is incinerator at the Ho regional hospital with a waste worker incinerating waste with firewood.

Source: Field work, 2016

Plate 8: An open burning pit in Matse CHPS Compound Exposed to the public

Source: Field work, 2016

5.7.3 Protective Equipment

The healthcare waste workers lamented that they worked under very difficult situations. For instance, not all of them had access to protective equipment and clothing. This was corroborated by the administrators who indicated that the Ministry of Health does not supply health facilities with adequate gloves, nose masks and boots to protect waste workers in order to reduce risk to needle injury and infection from infectious waste. **Figure 5.9 shows a waste worker wearing light gloves.**

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Plate 9: Waste worker poorly protected against needle injury. Waste worker wearing gloves that have been provided for her.

Source: Field work, 2016.

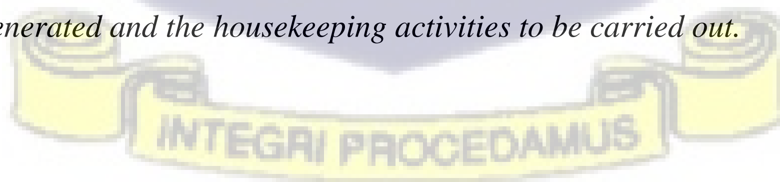
The provision of the complete PPE for waste workers and orderlies in not being practiced in most our facility and I am sure the same applies to other facilities as well as. In most cases, we are given gloves and boots without overalls. A major concern to me is how long it takes the authorities to attend to complains regarding worn-out PPEs. At times some orderlies and waste workers are seen wearing house dresses or personal clothes in working and this is not good.

5.7.4 Waste workers

Another challenge for healthcare waste management was stated as the inadequate number of waste workers in the health facilities. Some of the waste workers said the work is too stressful because they have a lot of waste to handle per day. This made them and continue to make them ineffective. The hospital administrators also indicated that the public does not find the waste work at the health facilities lucrative hence health facilities are under-staffed particularly in the area of waste workers.

In this facility the number of waste workers does not correspond to the quantity of waste generated and the work to be done. Currently orderlies are just about ten but they should be at least twenty of them working in this facility due to the large amounts of waste generated and the housekeeping activities to be carried out.

(Yao)



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5.7.5 Shortage of bin liners

The head of the waste workers in one of the health facilities as well as an in-charge at the theatre of a referral hospital indicated that sometimes there are shortages of bin liners in the facilities. A nurse who worked in the theatre in one of the facilities lamented:

> *'There have been instances whereby the right colour coded bin liner is not available for use so we are compelled to use any other colour coded bin liner. This can be misleading and because it makes it difficult to distinguish between infectious waste and general waste it can lead to injuries or infection. For example, for about two months we do not have a yellow bin liner used for infectious waste so we have been using the black liner for both infectious waste and general waste'. this makes waste segregation ineffective and problematic for waste workers and treatment methods as well. Well, I will say that the situation has been reported to the appropriate authorities but nothing has been done yet because we have been making use of the black bin liners for infectious waste for two months now as I said earlier on.*

5. 8 Chapter Synopsis and Conclusions

Healthcare waste management is associated with a lot of tools which are risky to handle. This chapter presented the findings on the relative exposure of the health workers to risk and their perceptions in respect to healthcare waste management in health facilities in the Ho municipality. The findings revealed a highly risk perception of waste management in selected facilities within the municipality.

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Previous research has shown that health personnel with a high or moderate understanding of the various categories and subclasses of healthcare waste most probable to have an adequate perception of the risks associated with the waste and, as a result, are more likely to manage the waste effectively than those with a low understanding (Awodele, Adewoye and Oparah, 2016; Ferreira and Teixeira, 2010; Tope et al., 2018; Adu et al., 2019; Yenesew et al., 2012). Furthermore, healthcare professionals who regard health waste management as a priority are more probable to handle it well than those who do not (Yazie Tebeje and Chufa, 2019; Wafula et al., 2019). Inadequate temporary storage bins, as well as bin liners coupled with defective lids incline healthcare personnel lead to the improper management of waste generated in the course of work. Sharps waste bins were discovered in wards with their lids not properly close, the contents of the central storage rooms were visible and accessible. The use of such poor provisional storage equipment puts healthcare professionals and waste handlers at danger of getting harmed or contracting illnesses if they came into touch with the waste. Furthermore, most of the facilities' central storage sections for onsite waste management were substandard. When a storage space lacks a well-fitted lock or has damaged windows, the site's security is jeopardized, and it becomes unwittingly accessible to the public. As a result, members of the public are at danger of getting in contact with waste and being exposed to its contaminated contents. All Ho Municipal healthcare institutions should have standard central storage rooms for healthcare waste.

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Many respondents expressed dissatisfaction with the lack of PPEs, particularly masks, gloves and boots for protection. Given the report of needle prick injuries, this is a major concern. It is established that a needle prick from an infected patient creates a 30 percent chance of healthcare personnel developing hepatitis B (WHO, 2018). As a result, many

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healthcare professionals were unprotected from the fatal illness such as Hepatitis B. These difficulties should be considered in the Ho Municipal's healthcare waste management strategies to reduce the environmental impact of improper healthcare waste management. The strategies must explicitly indicate the methods, means and effects of waste management practices as well as apply to waste generators and non-compliant hospital departments. The waste management strategies should also set the required number of training sessions that a healthcare personnel must attend, as well as enforce the delivery of healthcare waste management equipment in all facility departments and at the regional level to all healthcare facilities. Poor management practices of healthcare waste results in serious health effects to health personnel and the populace as well as negative effects on the environment as it creates brown environment. Also, there is the need for the provision of all necessary PPEs for the workers especially waste workers since these PPEs were either unavailable or partially provided and used.

Thus, the overall results show that the management of healthcare waste needs to be enhanced especially used needles. This is because several instances depict situations where general or domestic waste were mixed together which following literature increased the toxicity of the total waste steam. Also, PPEs in some instances were unavailable or were partially available or used for use by health personnel. a major concern that was raised was also the shortage of bin liners that created the problem of using black bin liners for infectious wastes and this served as a source of grave concern because it was noted to a be a potential source of risk or injuries to personnel who worked with waste. This situation also turns to affect effective segregation because both general waste and infectious could be mix together leading to the total waste stream becoming infectious. Per the MOH guidelines, both general and infectious wastes must

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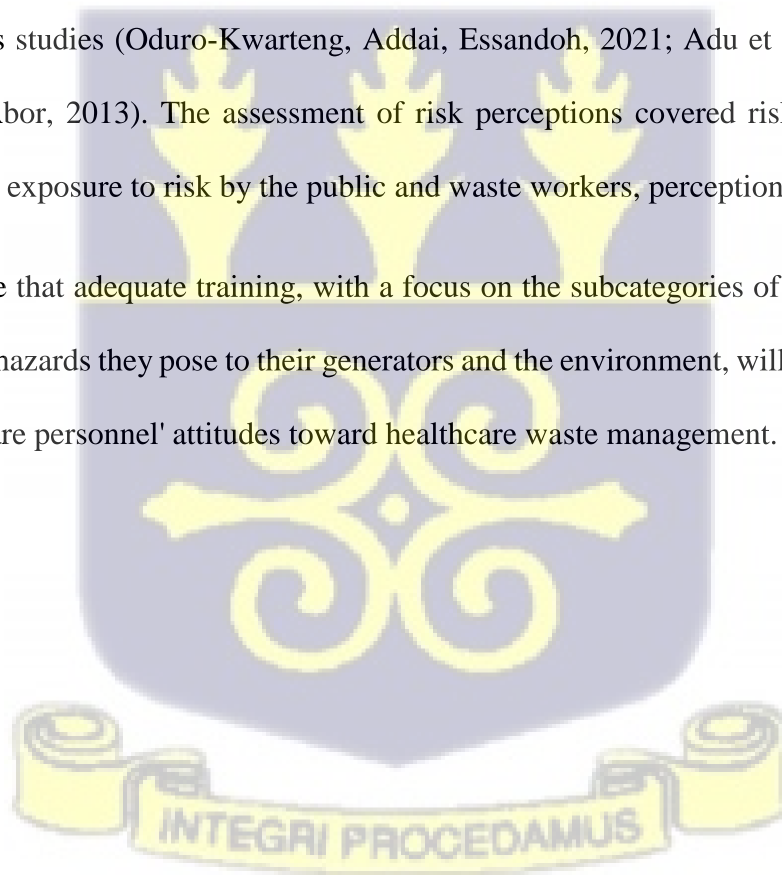
be separated into black and yellow bins or bin liners but with the situation of shortage of bin liners this practice became an illusion. It was however realised that segregation was not effective as noted by previous studies (Wang and Chaudhry, 2016; Badi, Shetwan and Hemeda, 2019) which is contrary to Odonkor and Mahami (2020) who investigated healthcare waste management practices and indicated that waste segregation was practiced in the facilities sampled. Moreover, practice of recycling, reuse and recovery become problematic when general and infectious waste are mixed together. Barriers enumerated included low awareness, inadequate training, lack of ineffective law to regulate healthcare waste activities, financial constraints which all lead to unsuitable management of waste. these barriers have been documented in previous studies (Oduro-Kwarteng, Addai, Essandoh, 2021; Adu et al., 2020; Akum, 2014; Abor, 2013). The assessment of risk perceptions covered risk of needle stick injuries, exposure to risk by the public and waste workers, perception.

I believe that adequate training, with a focus on the subcategories of healthcare waste and the hazards they pose to their generators and the environment, will aid in improving healthcare personnel' attitudes toward healthcare waste management.



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CHAPTER SIX

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The study sought to critically examine the knowledge, current practices and attitudes of staff on the management of healthcare waste in relation with Natioanl guidelies on the management of healthcare waste. The study also sought to examine the perception of healthcare personnel with regard to the potential risks of healthcare waste. In this chapter, a summary of main findings of the study are presented. The chapter also draws conclusions from the main findings with recommendations for effective and efficient healthcare waste management in healthcare facilities across the country.

6.2 Summary of main findings

Findings of this research are presented along the main themes of this work. These comprise of the knowledge, attitude and practices of healthcare waste management, risk perception of health personnel on potential risk associated with healthcare waste and the bottlenecks associated with waste management.

6.3. Key findings

Relative to the first objective, the study found that, the knowledge of healthcare waste management was high for nurses than other health personnel in the study area.

The study found some practices associated with healthcare waste management in the various institutions studied were in some cases not in conformity with national guidelines and other practise were in tandem with stipulated guidelines. For instance, though the practice of waste segregation was correctly done in some cases in especially public health facilities according to the appropriate colour coding there were instances

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where both infectious waste and general waste were seen to be mixed together in waste bins meant for general or infectious waste. It was also observed that with regards to the correct use of colour coded bins some private health facilities did not use the correct bins- black, yellow and brown but rather used blue bins and bin liners in their facilities.

Secondly, another key finding of this study was the practice of recapping needles. According to the guidelines on the management of healthcare waste in Ghana, health professionals are expected to recap needles after use on a patient. However, during the participant observation phase of this study, it was observed that, some nurses recapped needles after use. Though, the healthcare waste guideline stipulates non-recapping of needles, the practice was observed in some facilities be practised.

Thirdly, it was found by this study that the institution of waste management plan and committees which has been advocated by the MOH guidelines on the management of healthcare waste, were absent in all the surveyed facilities peer this study.

6.3.1 Knowledge, Attitudes and Practice of waste management

From the survey, the results show less than half (48 %) of the health workers had received some training in healthcare waste management. The result also showed that about 70 % of the laboratory technicians had been trained in healthcare waste management. However, it was found that 50 % of the orderlies had received some training in healthcare waste management. Generally, it was found that a greater proportion of the nurses (68.9 %) had good knowledge of healthcare waste management relative to the waste workers. The study also found that approximately 41 % of the healthcare workers recap needles. The analysis of the association between facility size and the practice of recapping needles shows that nearly 35 % of the regional hospitals

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recap needles before disposal compared to about 52 % of the district hospitals who do same. A chi-square test of association between healthcare facility size and the practice of recapping needles before disposal shows a significant association ($\chi^2 = 8.940$; Degrees of Freedom = 2; p = 0.011 at 0.05 significance level).

The study also found that all the respondents identified the correct colour code associated with General waste. Again, less than half (48 %) of the health workers can identify the correct colour code associated with used sharps. The study further found that approximately half (50.3 %) of health workers identify the colour code associated with Patient waste. For pharmaceutical waste, the study found that more than 70 % of the health workers identified the refuse bin in which the pharmaceutical wastes were stored. The result of this study shows that nearly 59 % of the health workers rated their protective attitude as high whereas 41 % of them rated their protective attitude as low. The results further show that 83 % of the Medical doctors rated their protective attitude as high whereas nearly 94 % of the laboratory technicians and 58 % of the nurses rated their protective attitude as high.

6.3.2 Risks Perceptions on potential risk of Healthcare waste

The study revealed that, the perception of the potential risk associated with waste especially infectious waste was moderate amongst nurses whilst, doctors risk perception is high. Only a few laboratory technicians and waste workers rated their risk perception to waste as high; that is 10% and 25% respectively. Personnel' perception about the harm that could be caused to the public was seen to be low as only 13% of health personnel rated their perception on potential harm the public could suffer as high. Perceptions on injuries that could be suffered by waste workers from needles and other sharp instruments, largely personnel were of the view that, waste workers were exposed

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to less risk to needle stick injuries than other health personnel. 50% of personnel stated that waste workers were less exposed. Additionally, health personnel rated their potential risk as higher than the public. The study found that personnel' rating perceptions on the severity of risk associated with each category of waste indicated patient waste and pharmaceutical waste to be the types of waste had the highest risks rating which stood at 76% and 69% respectively.

The results show that generally the health workers were of the view that waste workers at the health facilities are exposed to less risk of needle stick injuries from healthcare waste compared to the other health workers namely doctors, nurses, and laboratory scientists. It was further found that about 50 % of the respondents agreed that waste workers were exposed to less risk to needle stick injuries relative to the health workers. The study also found that nearly 69 % of the respondents were of the view that the public were exposed to less risk to needle stick injuries relative to the health workers in the health facilities from which healthcare waste is generated.

6.3.3 Bottlenecks Allied with Healthcare Waste Management

A number of factors were enumerated to affect the effective and efficient management of healthcare waste in the study area. These include but not limited to incineration facilities, ineffective segregation practice or colour coding, issues on the provision of personnel protective equipment, shortage of bin liners or segregation polythene and number of waste workers in a facility.

During the field work it was realised that in the Municipality the only incinerator that was functioning at the time this research was conducted was the incinerator at the teaching hospital. Incinerators in the Municipal hospital and Polyclinic were not functioning. It came to light that the regional hospital one could not incinerate the waste

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to expect standards as the gas component to power the incinerator broke down and firewood was being used for the incineration of waste. In addition to this, the head of waste workers at two facilities complained of inadequate waste workers as well as work load.

Another challenged this study found had to do with the incomplete supply of full protective equipment for orderlies. Orderlies were not provided with full personnel protective equipment as some were seen wearing the house dresses to work instead of overalls or jackets.

Shortage of waste bin liners was also found to affect effective segregation in the various facilities. They were instances were waste bin liners especially yellow bin liners for the segregation of infectious waste got finished and liners meant for general waste were used for infectious waste.

6. 4 Conclusions

Consistent with a study in Libya by Muluken et al (2013) where it was found that a greater percentage (53.1percent) of healthcare workers did not receive any form of training in healthcare waste management best practices, this study concluded that most health workers working in health facilities in Ho had not received training in healthcare waste management. It is also concluded that the study is consistent with Akum (2013) who concluded in a study that some healthcare workers in the Upper East Region of Ghana had received some sort of training in healthcare waste management but that the duration of training was not enough. The study therefore concludes that if healthcare personnel are trained vital knowledge and experiences would be gained on good management practices which would translate into good attitude towards risk mitigation and effective management of healthcare waste. Lack of training implies that healthcare

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personnel would not be aware of the MOH policy and guidelines for healthcare waste management in health institutions in Ghana.

This study also concludes that some of the waste workers in the region whose primary responsibility is to transport the waste from the generation to the collection or disposal point do not wear gloves always when performing their duties. This is consistent with similar studies in other parts of the world where it had been shown that waste workers did not always wear protective gloves when performing their duties (Patwary et al., 2011; Blenkharn & Odd, 2008, Chowdhury et al. 2011; Lavoie, 2010).

This study again concluded that health workers of different job categories perceive risks associated with healthcare waste differently. Whereas doctors, nurses and other healthcare workers who are directly involved in providing healthcare services to patients perceive that they have a greater risk of contracting infections from infected healthcare waste, orderlies on the other hand perceived that they are exposed to less risk of infection from healthcare waste.

Finally, it is concluded from the findings that the statutory practices and regulations in healthcare waste management are not being followed to the latter in the health facilities surveyed. In some cases, it was observed that healthcare wastes were not well segregated. Needles and cotton wool could be found in the same refuse bin in violation of statutory practices and regulations. Healthcare waste workers were not consistent in wearing protective equipment in handling healthcare waste. It is further concluded that waste workers are least vulnerable to risk of injury or harm from healthcare waste. The study was underpinned by the cultural theory and the theory of planned behaviour. These theories were employed to understand different the problem investigated. The cultural theory helped to explain the nature and extent to which different personnel perceived and rated risk perception while the theory of planned behaviour assisted in

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explaining the actions that were taken by the healthcare personnel in connection to healthcare waste management practices such as the recapping of needles.

6.5. Recommendations

Based on the study set objectives, key findings and conclusions, the following recommendations have been made for improvement in the management of waste in the Ho Municipality and the healthcare sector as a whole.

First and foremost, health personnel should be given regular training in healthcare waste management practices to improve upon the current practices of healthcare waste Management in health facilities in the Ho municipality. This recommendation will be a periodic reminder of workers about the codes and conducts of waste disposal in their various facilities. Moreover, it was realised during the field work that, some officials from the two referral facilities had gone for training on health waste management and were in-turn expected to train waste workers but this internal activity materialised. This the estate manager of one of the referral facilities attributed to lack of funds to organise in-service training.

Secondly, observations during the study showed that though there exist waste disposal guidelines from MOH of which workers are privy to, they hardly comply due to non-supervision from authorities. The study recommends for the regular supportive supervision of wards and other areas of facilities by senior administrators to ensure compliance of healthcare waste management practices and regulations. For instance, waste workers must be compelled to handle healthcare waste in health facilities with full PPEs on.

With reference to the deficit of waste disposal personnel and equipment like bins, bin liners, gloves and nose caps in the Ho Municipality, the study wish to recommend that

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the government should supply logistics needed to effectively manage healthcare waste. For instance, segregation of waste is expected to be done at point of generation but the inadequate bins at the wards force workers and clients to mix the waste generated thereby making it extremely challenging for waste workers to segregate at the point of incineration.

The study again recommends that all healthcare facilities in the Ho Municipality should be attached with at least an EPA official to ensure that waste generated are handled appropriately and disposed in an environmentally friendly manner by facilities. This is expected to protect the general public from infectious diseases.

Additionally, this piece of research recommends the setup of waste management committees as during the survey it was realised that even though the MOH guidelines on the management indicated that each facility should have a waste management committee but, actual field observation and qualitative survey showed that none of the facilities surveyed had a waste management committee in place.

This study again recommends that healthcare facilities should have healthcare waste management guidelines. Findings of this study revealed that even though there is a national document on the management of healthcare waste, the manual was only available in one public health facility. Reference to private health facilities, none of the surveyed private facilities had the national manual on the management of healthcare waste in Ghana.

To avoid needless degradation of organic waste at the source, healthcare waste must be stored for substantially shorter periods of time with optimal daily collection. Likewise, government legal agencies should develop a healthcare waste monitoring system, which should oblige all generators to work with the government to ensure its success.

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As a matter of urgent attention, broken down incinerators must be repaired immediately to avoid the dumping of waste as well as the use of gas for waste incineration should encouraged instead of the use of firewood since it is noted not to be effective in incinerating waste properly. In addition, the healthcare waste incineration facilities should be used to foster entrepreneurship training for those who will be involved with the operation of the incinerators. The goal should not only be to dispose of medical waste in a cost-effective manner, but also to run the entire process as a business. The functioning of the incineration plants should also act as a teaching ground for people who need to learn about the combustion of healthcare waste. Learners should be encouraged to not only learn about the fundamentals of healthcare waste incineration, but also to gain practical experience with entrepreneurial principles, such as realizing a business venture potential when one arises.

Finally, following from the high-risk perceptions indicated by personnel in terms exposure to healthcare waste, this study recommends that and any form of training or workshop even with peer review, issues of risk and risk perception should be duly included in the curricula. This would go a long way to prepare personnel very well through the acquisition of the necessary skills and knowledge in the management of waste and reduce fear.

6.6 Future Research

The purpose of this study was to demonstrate the need of proper healthcare waste management. The consequences of a lack of competent handling are also mentioned. The following are areas in which further research can be conducted in the area of healthcare waste management.

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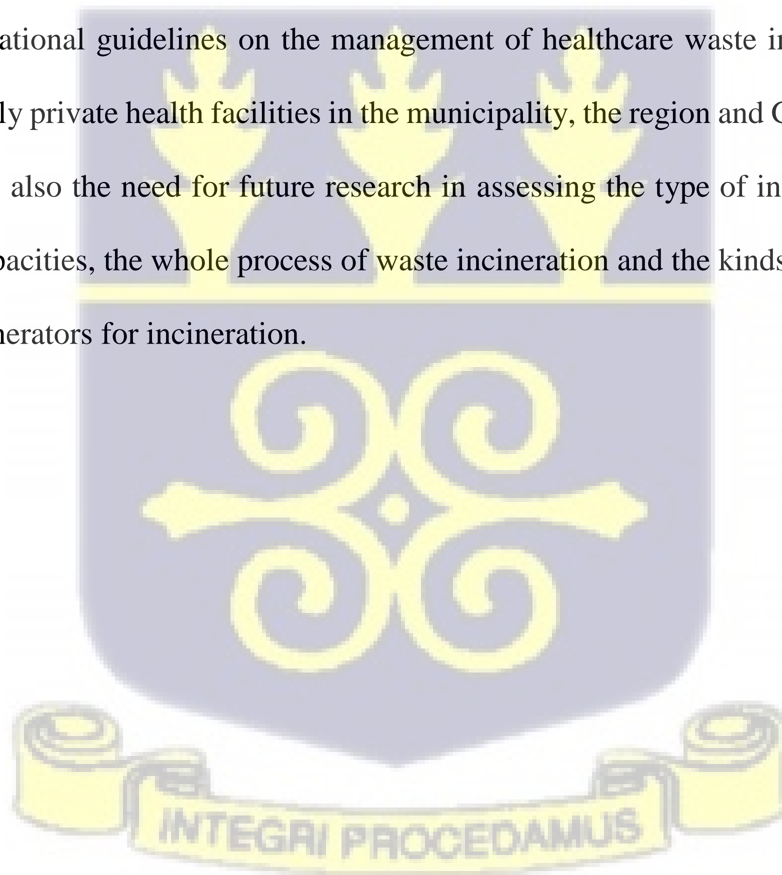
It's important to note that, despite their best efforts to have their wastes collected by either employee waste workers or licensed companies, generators still do not assume complete responsibility for their waste disposal. The education of healthcare waste generators and anybody involved in the management of healthcare waste will be critical in this regard. Therefore, entrepreneurship is the process of spotting opportunities, seizing them, and converting them into profitable business operations.

The total amount healthcare generated quarterly or annual is not known in the Ho municipal. This calls for research to ascertain the waste generation rates and quantity generated within a specific period or even daily.

Additionally, research is also needed to actually and effectively analyse the application of the national guidelines on the management of healthcare waste in health facilities especially private health facilities in the municipality, the region and Ghana as a whole. There is also the need for future research in assessing the type of incinerators in use, their capacities, the whole process of waste incineration and the kinds of waste send to the incinerators for incineration.



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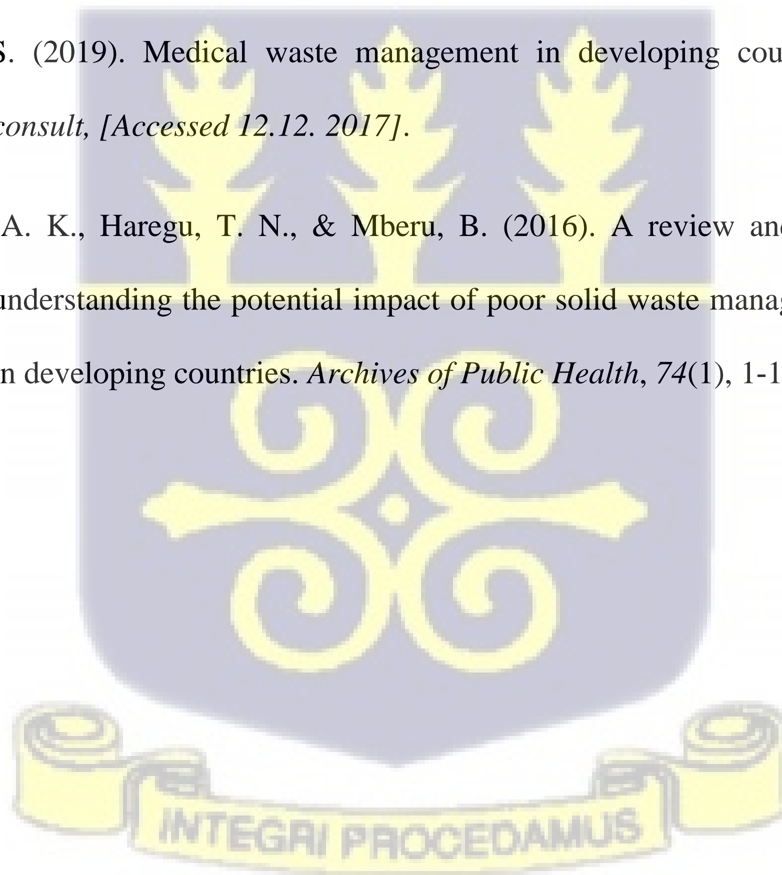

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APPENDIX 1:

QUESTIONNAIRE

This survey questionnaire is intended to collect data on healthcare waste management and the perception of risk associated with health care waste in selected healthcare facilities. The study is in partial fulfilment of obtaining an MPhil Degree in Geography and Resource Development from the University of Ghana. Your participation is highly appreciated. Responses would be treated with strict and utmost confidentiality.

SECTION 1: Background Information

1. Facility name: ……………………………………………………………………………
2. Facility type: **1.** Referral [ ] **2.** District Hospital [ ] **3.** Health centre/clinic 4. CHPS [ ]
3. Gender: **1.** Male [ ] **2.** Female [ ]
4. Education: **1.** Basic [ ] **2.** Secondary/ SHS [ ] **3.** Tertiary [ ] None [ ]
5. Job Category____
6. Number of years in service………………………………………………………………

SECTION II: Knowledge on Management of Health care Waste

7. Indicate your level of knowledge in healthcare waste management procedures?

   1. Very good [ ] **2.** Good [ ] **3.** Moderate [ ] **4.** Poor [ ]
8. To what extend do you know the risk associated with healthcare waste

   1. Very high [ ] **2.** High [ ] **3.** Average [ ] **4.** Low [ ]
9. Have you ever received any training on health care waste management?

   1. Yes [ ] **2.** No [ ]
10. Have you ever received any training on healthcare waste management in school?

    1. Yes [ ] **2.** No [ ]
11. Have you been given any special training on the risks associated with HCW?

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1. Yes [ ] **2.** No [ ]

12. Do you practice the recapping of needles? **1.** Yes [ ] **2.** No [ ]

13. At what point are bags containing waste supposed to be sealed?

1. When full to capacity [ ] **2.** Half way full [ ] **3.** Three-quarters full [ ]

4. Any point at all [ ]

14. Do you know how different categories of waste are labelled?

1. Yes [ ] **2.** No [ ] **3.** Don't know [

SECTION III: Regulation

15. Are you aware of the MOH manual on management of healthcare waste availabl?

1. Yes [ ] **2.** No [ ]

16. Is there a manual on the management healthcare waste available in your facility?

1. Yes [ ] **2.** No [ ]

17. State any healthcare waste management regulation ……………………………

18. Are you aware of a Waste Management Plan in your facility?

1. Yes [ ] **2.** No [ ]

19. Does your facility have a Waste Management committee? **1.** Yes [ ] **2.** No [ ]

SECTION IV: On-Site and transport Services

20. What kind of means is used for on-site transport of waste?

1. Open device [ ] Closed device [ ]

21. Is healthcare waste sorted on-site before collection and transportation in this facility? **1.** Yes [ ] **2.** No [ ]

22. Is recommended colour coding applied to waste before transportation?

1. Yes [ ] **2.** No [ ]

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23. Is there an area for temporal storage of healthcare in your facility? **1.** Yes [ ] **2.** No. [ ] 3. Don't know [ ]

SECTION V: Healthcare Waste Segregation and Handling

24. Are posters on waste segregation visible and displayed in your facility?

1. Yes [ ] **2.** No [ ]

25. Are wastes segregated according to recommended colour coding system? **1.** Yes [ ] **2.** No [ ] 3. Don't know

26. Where does segregation of waste take place in this facility? *Please state the site*

……………………………………………………………………………………..

27. How are segregated waste labelled? ……………………………………………

28. Are sharps segregated from other types of infectious waste?

1. Yes [ ] **2.** No [ ] **3.** Sometimes [ ]

29. In your opinion are procedures with regards waste segregation strictly followed?

1. Yes [ ] **2.** No [ ] **3.** Don't know [ ]

If no give reasons……………………………………………………………………

30. Is waste segregated into infectious and non-infectious waste in this facility?

1. Yes [ ] **2.** No [ ] **3.** Don't know [ ]

31. What is the colour code for each stream of waste with regards to disposal bins?

Hazardous waste……………………………………………………………........

Non-hazardous waste…………………………………………………………………

32. How often is waste removed from generation site in this facility?

33. Have you had any injury from a needle within the last 12months? **1.** Yes [ ] **2.** No [ ]

34. Period of injury **1.** Before [ ] **2.** During use [ ] **3.** After use [ ]

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35. What type of syringes do you use in this facility?

1. Disposable [ ] **2.** Sterilisable [ ] **3.** Auto-disable [ ] **4.** Safety syringe [ ]

36. Which equipment does staff handling waste use or have- (*you can select more than one*) 1. Eye goggles [ ] **2.** Gloves [ ] **3.** Boots [ ] **4.** Apron [ ] **5.** Trousers [ ] Mask [ ] 7. Other……………………………………………….....

37. Do you use gloves during handling of waste?

1. Yes always [ ] 2. Yes, sometimes [ ] 3. No [ ]

If yes what kind ……………………………………………………………………

If no, give reasons…………………………………………………………………

SECTION VI: Storage and Treatment

38. Would you say the place is secured? **1.** Yes [ ] **2.** No [ ] **3.** Don't know [ ]

35. Are wastes stored according to specific rules in this facility? **1.** Yes [ ] **2.** No [ ]

36. What kind of containers are used to store sharps? …………………………………

37. Has there been shortage of storage cans for sharps in the last 24 months?

1. Yes [ ] **2.** No [ ] **3.** Don't know [ ]

39. Is infectious waste treated before final disposal in this facility?

1. Yes [ ] **2.** No. [ ]

40. How regular is the treatment done in your facility?...

SECTION VIII: Risk Perception

41. There is enough protective equipment to lessen risks of healthcare waste

1. Strongly agree [ ] **2.** Agree [ ] **3.** Disagree [ ] **4.** Strongly disagree [ ]

42. How will you rate your protective attitude with regards to risk of healthcare waste?

1. Very high [ ] **2.** High [ ] **3.** Average [ ] **4.** Low **5.** Very low [ ]

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43. How much risk in opinion are you exposed to due to incineration of waste **1.** Very high [ ] **2.** High [ ] **3.** Average [ ] **4.** Low [ ] **5.** Very low [ ]

44. How will you rate your knowledge on hazards associated with health care waste?

1. None [ ] **2.** Low [ ] **3.** Moderate [ ] **4.** High [ ] **5.** Very high [ ]

45. What extent are you at risk to injuries from needles and other sharp instruments?

1 None [ ] **2.** Low [ ] **3.** Moderate [ ] **4.** High [ ] **5.** Very high [ ]

46. What about the public? **1.** None [ ] **2.** Low [ ] **3.** Moderate [ ] **4.** High [ ] **5.** Very high [ ]

47. Are you concerned that there could be an outbreak of diseases due to infectious health care waste?

1. Very much concerned [ ] **2.** Somewhat concerned [ ] **3.** Not very concerned [ ]

4. Not at all concerned

48. Information about the potential hazards and risk are readily available. **1.** Yes [ ] **2.** No [ ]

49. Public health authorities have said that disease contraction (risk) from infectious health care waste cannot be on a large scale. How confident are you in this risk assessment?

1. Very confident [ ] **2.** Somewhat confident [ ] **3.** Not very confident [ ]

4. Not at all confident [ ]

50. To what extent would you say managers of health and safety know the hazards and risks associated with health care waste in your facility?

1. None [ ] **2.** Low [ ] **3.** Moderate [ ] **4.** High [ ] **5.** Very high [ ]

51. When you consider the personal harm that hazardous healthcare waste can cause, what is your level of fear?

1 None [ ] **2.** Low [ ] **3.** Moderate [ ] **4.** High [ ] **5.** Very high [ ]

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52. Have you been vaccinated against hepatitis B? **1.** Yes [ ] **2.** No [ ]

53. **What challenges** are associated with healthcare waste management?

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

…………………………………………………………………………………

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APPENDIX 2

FIELD PICTURES

Inappropriate waste segregation

Infectious Waste

A burning pit

Inside of the burning pit

A broken-down Incinerato

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A waste worker at the placenta pit