



**HEALTHCARE WASTE MANAGEMENT IN HOSPITALS: THE CASE OF
ALL AFRICA LEPROSY AND TUBERCULOSIS REHABILITATION
TRAINING CENTER (ALERT) HOSPITAL IN ADDIS ABABA**

**By
AberraDiro**

Advisor: -FekaduGurmessa /PhD/

**Thesis Submitted to College of Social Science Department of Geography and
Environmental Studies in Partial Fulfillment of the Requirement for the
Degree of Masters of Arts**

**Addis Ababa
June 2019**

**ADDIS ABABA UNIVERSITY
COLLEGE OF SOCIAL SCIENCE
DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES**

Assessment of Healthcare Waste Management in Hospitals

The case of Alert Hospital in Addis Ababa

By: AberraDiro

A Thesis Submitted to the college of social science, Department of Geography and Environmental studies in Partial Fulfillment for the Degree of Masters of Arts.

Approved by Board of Examiners:

Advisor

Signature

Date

Chairperson

Signature

Date

Examiner (External)

Signature

Date

Examiner (Internal)

Signature

Date

ACKNOWLEDGEMENTS

For the success of this thesis many individuals and institute has contribute a lot. However first of all I would like to thank my advisor FekaduGurmessa (PhD) for unreserved comments, advice and contribution of ideas as well as sharing of time to read the earlier drafts of the paper.

For various data and information I received: my foremost thank goes to ALERT Hospital and workers who engaged in different sectors of the hospital for their kindness and hospitality during my actual collection and measurement in field. Finally my heartfelt thank go to all my families and my friends who directly or indirectly support me to accomplish this paper. Thank you all.

Table of Contents

Contents	Page
ACKNOWLEDGEMENTS.....	i
List of Tables and Figures.....	v
Abstract.....	vi
LIST OF ACRONYM.....	vii
CHAPTER ONE.....	1
1. INTRODUCTION.....	1
1.1. Background of the Study.....	1
1.2 Statement of the Problem.....	3
1.3 Objective of the Study.....	4
1.3.1. General Objective.....	4
1.3.2. Specific Objective of the Study.....	4
1.4 Research Questions.....	5
1.5 Significance of the Study.....	5
1.6 Scope of the Study.....	6
1.7 Limitation of the Study.....	6
1.8 Organization of the Thesis.....	6
CHAPTER TWO.....	7
2. REVIEW OF LITRATURE.....	7
2.1 Definition of Key Terms.....	7
2.2 Types and Characteristics of Health Care Waste.....	7
2.3 Global Perspectives of the Hazardous Medical Waste Management.....	10
2.4 Challenges those Health Care Institutes Might Face in HCWM Practices.....	11
2.4.1 Inadequate Awareness and Training Programs.....	11
2.4.2 Lack of Top Management Commitment.....	12
2.4.3 Lack of Institutional Arrangements.....	13
2.4.4 Lack of Proper Operational Strategy.....	13
2.4.5 Lack of Proper Segregation Practices.....	13

2.4.6. Collection and Storage.....	14
2.4.7 Transport.....	14
2.4.7.1 On-site Transport	15
2.4.7.2 Off-site Transport.....	15
2.4.8 Lack of Enforcement of Medical Waste Management Regulations.....	15
2.4.9 Lack of Commitment and Integration	16
2.4.10 Lack of Adequate Facilities	17
2.5Lack of awareness or negligence to How to Sort Wastes	17
2.6Treatment and Disposal of Waste	18
CHAPTER THREE	22
RESEARCH DESIGN AND METHODOLOGY	22
3.1Description and Selection of Study Area	22
3.2Research Methodology.....	24
3.2.1 Data Type and Data Source	24
3.2.2 Research Design	24
3.2.3 Target Population	24
3.2.4 Sampling Design.....	25
3.2.5 Data Collection Instruments	25
2.2.6 Data Processing and Analysis.....	26
CHAPTER FOUR.....	27
4. Data Analysis and Discussion.....	27
4.1-Basic Information of Respondent	27
4.2 The General Scenario of Health Care Waste Management of Alert Hospital	29
4.2.1 Segregation	29
4.2.2 Infectious.	30
4.2.3 Chemical wastes	30
4.2.4 Pharmaceutical.....	30
4.2.5 Sharps	31
4.3 Availability of Color Coded Waste Containers.....	32

4.4. Transport	36
4.5 Treatment	37
4.6 Disposal.....	38
4.6.1 Ash Pit	38
4.6.2 Incinerator.....	39
4.7 Assessment of Impacts of HCW Incineration in ALERT hospital on Human Health and Micro Climate of the Surrounding.	40
4.8 Assessment of Level of Awareness in Handling Health Care Wastes	42
4.9 Assessment of Victims of Unmanaged HCW in Alert Hospital?	43
4.9.1 Assessment of Accreditation trends by EPA	44
4.9.2 Major Challenges in Managing Healthcare Wastes	45
4.9.3 Poor Segregation.....	46
4.9.4 Poor Control	46
4.9.5 Poor motivation of the management.....	47
4.9.6 Problem of Transportation.....	47
4.9.6.1 On-site Transportation of HCW.....	47
4.9.6.2 Off-Site Transport.....	48
4.9.7 Shortage of Personal Protective Equipment	49
4.9.8 General Comments Related to HCWM of Alert Hospital.....	49
CHAPTER FIVE	51
CONCLUSIONS AND RECOMMENDATIONS	51
5.1. Summary	51
5.2 Recommendations.....	52
References.....	54
Appendices	

List of Tables and Figures

	Page
Table 1. Sex information of respondents	27
Table 2- Educational Back Ground of Respondents	27
Table 3 Work Experiences of respondent	28
Table 4- segregation of waste in alert Hospital	29
Table 5- availability of color coded wastes	32
Table 6- Health care waste transportation of Alert hospital.	37
Table: 7 the scenario of healthcare waste disposal of Alert hospital	38
Table 8 - assessment of level of awareness of different stake holders in ALERT hospital in handling health care wastes	42
Table 9- victim groups of unmanaged health care waste in ALERT hospital	44
Table 10-Major challenges of HCWM in ALERT hospital.....	45

List of Figures

Fig 1- Open pit (where HCW burn).....	32
fig 2-remainder of sharps (syringes).....	32
Fig 3 and 4 un-managed and scattered wastes	34
Fig. 5. Example of on-site HCW Conveyance.....	48

Abstract

Hospitals are among the complex institutions which generate a broad range of hazardous waste materials those are potentially high risk for human health and for the environment if not properly handled. This study dealt with the assessment of the existing practice, challenges and impacts of the HCWM of Alert Hospital. Descriptive research design was used. Both primary and secondary data have been used. Primary data has been collected through the use of questionnaires, interviews, Focus Group Discussion and personal observation. The researcher chose the respondents of this study using non probability sampling procedures. The questionnaires were designed in order to get the feedback from the Healthcare institute about the existing waste management practice of Alert Hospital, interviews conducted with the cleaners of the Hospital who are expected to be the most victim groups. The research data analysis mainly used qualitative data analysis methods using Microsoft excel. The study identified the existing waste management practices, challenges facing to handle HCW, and the impacts of HCW on health and environment. The study discovered reasons for low performance of HCWM in the healthcare institute as: lack of awareness, negligence, insufficient PPE, lack of standardized incinerator, lack of auditing and controlling mechanism and absence of certification system by EPA. Lack of proper attention from concerned bodies in general and commitment from the management of the hospital in particular and others are becoming a threat for staff members and beneficiaries because of the unsafe management of hazardous wastes. The MOH, EPA and other stakeholders need to revise the existing system and their policy to incorporate this risk issue. Thus, the researcher recommends that the current waste management practice needs to improve its waste management practice by arranging awareness creation program, working in collaboration with EPA, and adopting auditing and certification mechanisms, minimizing or reducing the existed challenges and revising and developing practical policy and applying the existing one.

LIST OF ACRONYM

ADR :	Dangerous Goods by Road
EE :	Environmental Economics
EMT :	Environmental Management Team
EPA :	Environmental Protection Authority
FGD :	Focus Group Discussion
GAVI :	Global Alliance for Vaccines and Immunization
HCC :	Healthcare Center
HCW :	Healthcare Waste
HCWM :	HealthCare Waste Management
HIV :	Human immune virus
ICESE :	International Conference on Environmental Science and Engineering
IP :	Infection Prevention
ISWA :	International Solid Waste Association
IV :	Intra Venous
MD :	Medical Director
MDG :	Millennium Development Goal
MOH :	Ministry Of Health
MRSA :	Methicillin-Resistant Staphylococcus Aureus
MT :	Metric Tones
PPE :	Personnel Protective Equipment
PVC :	Poly Vinyl Chloride
RNC :	Renewable Natural Capacity
SE :	Sustainable Environment
TVET :	Technique and Vocational Education Training
UN :	United Nations
UNEP :	United Nation Environmental Program
UNISA :	University of South Africa
WCED :	World commission on Environment and Development
WHO :	World Health Organization

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the Study

Healthcare waste poses a risk for patients, nearby residences, personnel who handle those wastes and the environment. Healthcare wastes particularly those infectious and hazardous can pose serious threats to environment and human health and require special treatment and management prior to their final disposal. Waste piles attract variety of disease vectors like mosquitoes and flies that can cause environmental pollution, unpleasant odors and create suitable ground for the growth of insects, rodents and worms that leads to transmission of diseases like typhoid, cholera. Not only those, unsafe waste management can be also a cause for HIV Aids, Tuberculosis, Hepatitis B and C through injuries from sharps contaminated with human blood (*HWM national Guide lines, 2008*). Hence, the management of healthcare wastes requires special attention and needs to be assigned high priority. Countries all over the world are continually looking solution and alternative to improve their health standards. A way to improve the standards can be achieved by establishing various healthcare institutions. However, different healthcare activities in these health institutions lead to the generation of tremendous amount of healthcare waste. Hospitals are one of these health institutions where different medical activities are going on and as a result produce a large amount of waste. The hospital waste management is one of the major environmental concerns, which may significantly increase exposure to infectious pollutants. Hospital waste in particular has increased largely because of rapid advances of medical activities and hospitals use relatively more disposable items.

Due to its infectious and hazardous nature, the management of healthcare waste is of great importance. The awareness of public regarding healthcare waste issues and Government regulations has forced healthcare institutions to adopt suitable strategies for managing these wastes.

Though, there are many techniques for healthcare wastes reduction, waste management practice in healthcare sectors are not free from challenges (2012 international Conference on Environment Science and Engineering).

In 2004 the Federal Government of Ethiopia adopted a comprehensive national policy on healthcare waste management from UNEP (Biomedical Waste Food Security Guidelines FEPA, 2004).

Countries designed different guidelines to manage health care wastes based on their own country's specific base line information. However, in the case of Federal Government of Ethiopia, the information for designing the required guide lines to manage health care wastes and maintain safe and sustainable environment was adopted directly from the United Nation Environment Program (UNEP, 2004) guide lines. This is because there were no adequate information and research done on this issue in Ethiopia.

Most healthcare administrators are concerned only with the costs directly related to waste disposal including, collection, transportation, treatment, disposal and efficient utilization of resources. But the waste generated has indirect impacts on human health and the sustainable environment after disposal (2012 international Conference on Environment Science and Engineering).

The nature and quantity of healthcare waste generated as well as institutional practices with regards to sustainable methods of healthcare waste management, including waste segregation and waste recycling are often poorly examined and documented in Ethiopia. Health care waste management in the developing countries unlike the developed countries is the major cause and problem of the society and their environment (Journal of sustainable development in Africa, 2010). Though, there are different mechanisms to manage healthcare wastes, developing countries including Ethiopia faced challenges in managing healthcare wastes particularly hazardous wastes which might seriously affect health of the society in particular and the environment at large.

Methods of disposal of waste are incineration, sterilization, chemical disinfection and secured landfill. Segregation of medical waste must be done at the point of generation. This should be done by discarding the medical waste in color coded containers. Incineration, chemical disinfection and microwaving are methods of disposing sharps. Radioactive waste must be handled, stored and disposed in accordance with the prescribed legislature. Laboratory and associated waste directly involved in specimen processing can be disposed either through

incineration or chemical disinfection. Human tissue must be disposed through incineration. Disposal of pharmaceutical waste depends on the composition of the materials. It must be stored in non-reactive containers and disposed through incineration (Chartier et al, 2014).

In order to prevent injuries to other employees, patients and to protect the environment from medical waste, health care workers must have adequate knowledge on disposal of medical waste. Hospitals have the responsibility to capacitate their employees with regard to medical waste disposal. The training should include occupational hazards, management of exposure to blood and body fluids, procedures to follow when disposing medical waste and prevention of injury and diseases, management of needle stick and blood and body substance exposure (South Africa, 2008). Thus it is relevant to try to assess the situation of a given health institute regarding its health care waste handling system and that is why the researcher has passionate to assess the health care handling system of Alert Hospital.

1.2 Statement of the Problem

The available scientific evidence on the waste-related health effects is not conclusive, but suggests the possible occurrence of serious adverse effects, including mortality, cancer and milder effects. Ethiopia is signatory to the Stockholm Convention of 2001 on eliminating or restricting the production and use of Persistent Organic Pollutants (POPs). WHO Policy Paper on safe healthcare waste management supports the Stockholm and Basel Conventions. It directs countries to develop and implement plans, policies, legislation and manual on safe healthcare waste management; allocate human and financial resources for safe healthcare waste management and scale up the promotion of non-incineration treatment alternatives. (<https://en.m.wikipedia.org/wiki/stockholm>).

In general, regarding health care waste management guidelines and procedures have been adopted especially from (UNEP, 2004) but, their implementation and regulation are still at its early stage and no significant change is observed. As a result it is highly influencing the environment and human health. There were some studies conducted on West Gojam public healthcare institute and Gondar area healthcare institutions that dealt with the quantity of healthcare waste generated from each healthcare institution per day by (Azage, 2010). However, the researcher did not find any studied result on Hospitals' waste management and their impacts

on human health and on the environment particularly in Addis Ababa and more participatory of ALERT Hospital. With this foreground, this research has tried to look in to the assessment of the existing healthcare waste management practice, challenges and its impacts on human health and environment and also it looked in to the perception of potentially victim groups on unsafe waste management in ALERT Hospital.

1.3 Objective of the Study

1.3.1. General Objective

The general objective of the study was to assess the existing experiences and challenges of Health Care Waste Management in ALERT Hospital and its impacts on human health and environment.

1.3.2. Specific Objective of the Study

The specific objectives of the study were:-

- ❖ To assess the contribution of HCW of ALERT hospital in environmental pollution and as well as in micro (local) climate change.
- ❖ To assess the impact of HCW of ALERT Hospital on human health..
- ❖ To assess the existing waste management system of ALERT Hospital.
- ❖ To evaluate the level of awareness of medical personnel, supporting staff and the beneficiaries about the handling of medical wastes.
- ❖ To assess the possible victims of the improper handling of healthcare wastes in ALERT hospital.
- ❖ To examine the role of concerned government bodies in controlling and auditing the waste management activities of ALERT Hospital.
- ❖ To identify the major challenges in managing healthcare wastes at ALERT hospital.
- ❖ To identify possible recommendation issues based on the findings in ALERT Hospitals' health care waste management.

1.4 Research Questions

- Is there any contribution of HCW of ALERT hospital in an environmental pollution and local climate change?
 - What is the existing general waste management practice in Alert Hospital looks like?
 - Do the medical personnel and supporting staffs have sufficient awareness about medical waste management and safe handling to carry out it from segregation to disposal?
 - Do the beneficiaries of the hospital have any awareness about health care waste and how to handle it?
 - Who are the most exposed group of the existing impact of uncontrolled waste management at alert hospital?
 - What the relationship between the auditing and controlling governmental bodies and the hospital looks like?
 - What are the major challenges in managing medical wastes in Alert hospital?

1.5 Significance of the Study

Despite of the fact that is stated by the (WHO, 2004) 10% to 20% of healthcare wastes are hazardous and health care activities lead to the production of wastes that may also lead to adverse health related and environmental pollution effects. Healthcare wastes, whether generated at smaller rural clinics or larger facilities, can be managed where adequate and well-operated infrastructures exist. Until countries are in transition and developing they do not have access to health-care waste management options that are safer to the environment and health, incineration may be an acceptable response when used appropriately as stated by the (UNEP, 2006).

The research findings would give better insights into the understanding of:

- The environmental pollution and climate change caused by hospitals HCW.
- The draw backs with the existing waste management practice and recommended solutions,
- The impact that is influencing the environment and h

- Level of awareness of the staff members and beneficiaries about waste segregation and disposal.
- Gives clue what inputs are required in order to have safe waste management.
- It might inform policy makers, healthcare stakeholders, concerned Government officials, victims of healthcare wastes to look into better management practices.
- Other researchers Might also use it as a clue for further future research on this issue.

1.6 Scope of the Study

This research was not assessed the waste generation issues. Thus, the scope of this research was limited only to the assessment of the existing waste management practice and it's impacts on environment and human health with in and around the ALERT hospital.

1.7 Limitation of the Study

Due to shortage of budget, the scope of the study was limited only to the assessment of the existing healthcare waste management practice and impacts of ALERT Hospital.

1.8 Organization of the Thesis

The first chapter of this study which is the introduction of the research contained; -

Background of the study, problem of the statement, both general and specific objective of the study, significance of the study, scope and limitation of the study.

The second chapter contained the review of literature and the third chapter which is design and methodology of the research which incorporates:-data collection, sampling methods and tools, procedures and study area and time plan. The fourth chapter was focused on field works which consists of collecting, organizing and analyzing of the data collected during the survey and the findings of the research.

The last chapter which is the fifth dealt with the conclusion and recommendations of the study based on the result of the research and the general review of the literature. Finally, bibliography, appendices, references and other necessary write ups are annexed at the end of the paper.

CHAPTER TWO

2. REVIEW OF LITRATURE

2.1 Definition of Key Terms

Waste: Waste is a material discharged and discarded from each stage of daily human life activities, which leads to adverse impacts on human health and the environment (Bringi, 2007)

Healthcare waste: Materials generated as a result of patient diagnosis, treatment, or the immunization of human beings or animals is referred to Healthcare waste (Manyele, 2004).

Infectious Waste: Infectious waste' refers to the portion of medical waste that could transmit an infectious disease. Thus, medical waste is a subset of HCW, and regulated medical waste, which is synonymous with 'infectious waste' from a regulatory perspective, is a subset of 'medical waste'. As stated, infectious waste is waste that is capable of producing an infectious disease; chances of these are higher within healthcare institutions than outside. This definition requires consideration of the factors necessary for induction of disease, which include dose, host susceptibility, the presence of a pathogen, the virulence of a pathogen, and the most commonly absent factor, a portal of entry. Therefore, for waste to be infectious, it must contain pathogens with sufficient virulence and quantity so that exposure to the waste by a susceptible host could result in an infectious disease (Blackman, 1996).

Hazardous Wastes: are wastes that are danger to human health and the environment and are hazardous in nature which consists of wastes that are pathogenic, chemical, explosive, toxic or radioactive materials (Griffin, 1990).

Waste disposal: Waste disposal is the final placement of treated waste using environmentally acceptable method of final storage appropriate to the local conditions (World Health Organization, 2005).

2.2 Types and Characteristics of Health Care Waste

According to (WHO, 2004) there are two types of waste streams that are generated by healthcares. The first type is non-hazardous and makes up approximately 80-90% of healthcare wastes, consisting of food wastes, office materials, packaging, workshop residuals, non-

infectious patient waste, disposable masks and gowns, plastic water bottles, etc. The remainder is hazardous in nature and consists of wastes that are pathogenic, chemical, explosive, toxic or radioactive.

A large portion of this waste is incinerated but incineration of biomedical waste emits Carbon Dioxide (CO₂) and Nitrous Oxide (N₂O) which affects the environment and the society within. According to Canadian Nurses Association (2008) incineration is the largest source of dioxins and furans. Dioxins and furans are persistent organic pollutants that are among the most toxic compounds in our environment. Dioxins are a recognized human carcinogen with human exposure almost exclusively through food. High levels of exposure are linked to cardiovascular disease, hypertension, miscarriage and infant death, birth defects, low birth weight, growth retardation and cancer (Hancock & Dale, 2001; WHO, 2002).

The improper management of medical waste causes serious environmental problems in terms of air, water and land pollution. The nature of pollutants can be classified as biological, chemical and radioactive. Environment problems can arise from the mere generation of medical waste and from the process of handling, treatment and disposal.

Mismanagement of healthcare waste implies a combination of improper handling of waste during generation, collection, storage, transport and treatment. Improper handling comprises several unsafe actions, such as handling with- out personal protective equipment (PPE), poor storage (e.g. high temperature conditions combined with prolonged storage times before treatment), manual transport for longer distances, use of uncovered containers instead of closed plastic bags, dumpsites nearby residential areas, etc. Other examples include exposure times beyond acceptable limits, lack of worker and equipment decontamination procedures, lack of awareness and training etc., all of which affect healthcare institution workers, residents and the environment in different ways (www.icrc.org, November 2011).

Considerable amount of energy is consumed by healthcare institutions, water and other renewable and non-renewable resources. Inevitably this consumption produces a wide variety of waste ranging from the comparatively benign outputs such as glass, cardboard and food wastes to the extremely hazardous persistent organic pollutants, heavy metals, radioactive materials and cytotoxic drugs. These wastes are disposed of in a number of ways. The majority

of a healthcare's liquid waste is discharged as waste water seepage, while liquid containing toxic materials, such as cyanide, chromic acid, phenol compounds, solvents and mercury need to be collected and processed as hazardous waste (Hancock, 2001).

Many of the disinfectants and cleaning agents that are used to sanitize and sterilize the healthcare environment usually contain harsh chemicals. Thus, healthcare's interior environment is subjected to harsh chemicals which pose health risks to staff and patients.

This ubiquitous exposure to toxic chemicals on a daily basis is being increasingly linked to high rates of asthma, dermatitis and allergic reactions (Canadian Nurses Association, 2008; Hancock, 2001).

Incineration of biomedical waste also accounts for about 9% of the Canada's mercury emissions and the emission of other heavy metals (Canadian Association of Physicians for the Environment 2000; Hancock 2001; Rose & Bride 2009; Sibbald, 2001). Mercury is a potent neurotoxin that affects humans most commonly through fish consumption.

Once in the environment mercury is transformed by bacteria into methyl mercury that can readily affect brain, spinal cord, kidneys and liver functions; (Health Care without Harm, 2002).

Medical waste can be infectious, contain toxic chemicals and pose contamination risks to both people and the environment. If patients are to receive health care and recover in safe surroundings, waste must be disposed of safely. Choosing the correct course of action for the different types of waste and setting priorities are not always straight forward, particularly when there is a limited budget.

The management of the waste from health services is complex and to be successful it must be understood and addressed by everyone working in health services from those washing the floors to the senior administrators. Health-care activities are a means of protecting health, curing patients and saving lives.

But they also generate waste. Some researchers showed that 20 percent of healthcare wastes entail risks either of infection, of trauma or of chemical or radiation exposure which also affects the environment (WHO, 2004).

Although the risks associated with hazardous medical waste and the ways and means of managing that waste are relatively well known and described in some manuals and other literature, the treatment and elimination methods advocated require considerable technical and financial resources and a legal framework, Poor waste management can jeopardize care staff, employees who handle medical waste, patients and their families, and the neighboring population. In addition, the inappropriate treatment or disposal of that waste can lead to environmental contamination or pollution (Prüss, Giroult, and Rush brook, 1999 and WHO, 2010).

Despite the creation of different laws and rules of healthcare waste management by Governments, healthcare centers are faced lot of challenges to manage wastes that are generated from their own healthcare center (Kaiser, Eagan and Shaner, 2001).

2.3 Global Perspectives of the Hazardous Medical Waste Management

Environmentally sound management involves taking all practical steps to protect human health and the environment from hazardous wastes, like medical waste. In an ideal world, this would mean reducing the generation of hazardous wastes to zero. In practice, environmentally sound management means strictly controlling the storage, transport, treatment, reuse, recycling, recovery and final disposal of wastes (UNEP, 2000). When segregated and properly managed, medical waste streams are usually very small in quantity (WHO, 1999). In addition, most waste generated in the healthcare facilities can be treated as regular municipal solid waste except for a varying portion needing special attention such as sharps, pathological wastes, and other potentially infectious wastes, pharmaceutical, biological and hazardous chemical wastes, collectively known as “Special healthcare wastes” and requires proper packaging, storage, transportation and disposal (World Bank, 2000). The lack of segregation between hazardous and non-hazardous waste, an absence of rules and regulations applying to the collection of waste from the hospital wards and the on-site transport to a temporary storage location, a lack of proper waste treatment, disposal of hospital waste along with municipal garbage, insufficient training of personnel, insufficient personal protective equipment and lack of knowledge regarding the proper use of such equipment are among the problems highlighted in literature are prominent factors contributing to poor medical waste management (Manyele and Anicetus, 2006; Meherdrad et al., 2004).

In Africa, the situation of poor medical waste management is similar in South Africa, Mozambique, Swaziland, Kenya and Tanzania (Leonard, 2003;Manyele et al., 2003, Manyele, 2004a; Manyele 2004b;Manyele and Anicetus, 2006). Illegal dumping is a serious problem in most developing countries. Almost all the countries recognized poverty as a basic factor that dwarfed the success of African efforts in the area of environmentally sound management of hazardous waste. An additional challenge was the state of the medical waste incinerators of the low operating temperatures (~200°C), resulting in excess generation of toxic gases like HCl, CO, co organics, dioxins and furans. Since the locations of these facilities (in hospitals) are usually located in very close proximity of communities, the emissions from the incinerators present a serious health risk to the same community which the hospital is meant to serve (Manyele, 2004a).

2.4 Challenges those Health Care Institutes Might Face in HCWM Practices

2.4.1 Inadequate Awareness and Training Programs

Training of health care workers is the core of health care waste management programmer to recognize health and safety hazards, and to prevent further exposure to hazards posed by hospital waste. In reality, health care worker training programs have increased the workers' morale. However, the training focused only on those handling hospital waste and health officers, while the waste generators (nurses and medical doctors) were not involved. For this reason, a comprehensive integrated health and safety training programme should be implemented to provide a cost-effective means of meeting health care waste management (Griffin, 1990, Blackman, 1996).

Healthcare-waste handling is a hazardous waste activity which requires a high standard of training. It calls for specific training that depends on the nature of the work in the hospital, the hazards and possibility of worker exposure, and the responsibilities of individual workers. The training must not only be continuous, but also comprehensive, integrated and structured with the necessary elements. To reach the qualified stage, the training must follow some of the following steps: need analysis; training administration; learning objectives development and lesson plans; site-specific training; task-specific training; and supervision. As healthcare

institutions' activities are similar, these steps will be almost the same for different healthcare institutions, so that the training sessions can be conducted for each worker categories.

Factors to consider include trainers' qualification, reciprocity (e.g. the Ministry of Health's acceptance of course work offered by the University), equivalency (determination that previous experience, education or training is equivalent to a given training course), and programme evaluation monitoring and revision of the training as a result of the comments received from participants, instructors and supervisors (Rutala and Mayhall, 1992).

Awareness of appropriate handling and disposal of health-care wastes among health personnel is a priority; it is essential that everyone should know the potential health hazards. Regular programs will help prevent exposure of health-care wastes and related hazards. Poster exhibition, proper labeling, and explanation by staff are effective methods. Seminars and workshops, and participation in training courses are also essential. Management in most of healthcare institutions of developing countries is not aware of cost savings achieved due to good waste management practices. It has also been estimated that disposal savings of between 40% and 70% could be realized through the implementation of a healthcare waste reduction program (Patil, 2001).

2.4.2 Lack of Top Management Commitment

Governments and the healthcare providers have gone in for one type of option for treatment of the waste. No health care provider wants or has undertaken a base line survey to collect data regarding quantum of waste and its type being generated, nor about the waste generation points in its premises. Top management in most of developing countries' healthcare institutions is showing inertia in dealing with the waste problem. The wastes are therefore instead of being segregated, discharged in a mixed condition to the site of disposal. (MengestuZelalem 2014).

2.4.3 Lack of Institutional Arrangements

Management of health-care waste depends on the input from the administration and active participation by trained staff in segregation, storage, collection, transportation, treatment and disposal. A committee consisting of the head of the establishment, all the departmental heads, hospital superintendents, nursing superintendents and hospital engineers should be formed with a waste management officer who would be advised by an environmental control advisor and an infection control advisor is required for proper waste management purposes. Studies showed lack of such kind healthcare waste management committee or a documented waste management and disposal policy is the major reason for the improper management of healthcare wastes (Tudor, 2010).

2.4.4 Lack of Proper Operational Strategy

Operational plans should include the location and capacity of the storage containers, frequency of collection for various types of wastes and schedule of activities. Infectious wastes are to be stored in the designated color-coded leak-proof containers for safe handling and can be disinfected / sterilized by the available facility in the health cares.

Transportation of waste within the hospital is to be carried out in closed handcarts to avoid spillage of waste to a disinfection or treatment facility. After disinfection/ sterilization the waste is transported to a common treatment facility, such as an incinerator or controlled landfill. In some developing countries like Ethiopia healthcare wastes are collected in mixed forms, transported in open carts thus allowing spillage to occur and waste sharps are discarded without disinfection and mutilation, which may result in their being, re-used thus spreading an infection (Tudor, 2010).

2.4.5 Lack of Proper Segregation Practices

Segregation is the first step and most important level of healthcare waste management. Poor segregation practices significantly increases the quantity of infectious medical waste as mixing of infectious component with the general non-infectious waste. Poor or no segregation makes the entire mass potentially infectious. There is inadequate practice of segregation of the waste starting from generation to disposal. Even if the segregation of waste at the point of generation is

effective, waste handlers are found mixing it together during the collection and results in loss of ultimate value of segregation. Thus, wastes can be mixed at the point of generation and/or during collection and transportation which also resulted in increasing the infectious rate (Kaiser and Eagan, 2001).

2.4.6. Collection and Storage

Waste must be collected regularly - at least once a day. It must never be allowed to accumulate where it is produced. A daily collection program and collection round must be planned. Each type of waste must be collected and stored separately. Infectious wastes (categories 1 and 2) must never be stored in places that are open to the public.

The personnel in charge of collecting and transporting wastes must be informed to collect only those yellow bags and sharps containers which the care staff has closed.

They must wear gloves and the bags that have been collected must be replaced immediately with new bags. The wastes can be stored for a week in a refrigerated area (3° to 8° C). Where there is no such refrigerated area, the storage time for infectious medical waste must not exceed 72 hours in winter and 48 hours in summer when it is in temperate climate but when the climate is hot, it should be 48 hours in cool season and 24 hours in hot season (WHO, 1999).

A specific area must be designated for storing medical waste and this area should be closed and access restricted, separated from any food store, protected from rodents and birds, this area should be near to the incinerator and the entrance must be marked with a sign (“No unauthorized access”, “Toxic”, or “Risk of infection”) (WHO, 1999).

2.4.7 Transport

As far as possible, the means used for transporting waste must be reserved for that purpose, and different means must be used for each type of waste.

These means of conveyance must be easy to load and unload, they must not have any sharp corners or edges that might tear the bags or damage the containers; they must be easy to clean; (with a 5% active chlorine solution) and they must be clearly marked. Transport could be on-site transport when waste is disposed within the healthcare center and off-site transport when waste is transported somewhere else for disposal.

2.4.7.1 On-site Transport

Different means of conveyance may be used inside the facility – wheelbarrows, containers on wheels, carts and other means of transportation can be used.(Lokichokio, 2001)

Inside the healthcare facility, wastes must be transported during slacker periods.

The itinerary/rout must be planned so as to avoid any exposure of staff, patients or the general public. It must run through as few clean zones (sterilization rooms), sensitive areas (operating theatres, intensive care units) ICU or public areas as possible.

This also has the advantage of avoiding the complications involved in the transport of hazardous substances.

Different treatments or disposal techniques might be used for hazardous medical waste, depending on the circumstances and the type of waste concerned: example; disinfection using different chemicals, using biological enzymes, thermal like incineration, mechanical processes, and landfills and using pits (WHO, 2009).

2.4.7.2 Off-site Transport

According to (WHO 1999) Janitors must wear gloves while handling HCWs and the bags that have been collected must be replaced immediately with new bags. The wastes can be stored for a week in a refrigerated area (3° to 8° C). Where there is no such refrigerated area, the storage time for infectious medical waste must not exceed 72 hours in winter and 48 hours in summer when it is in temperate climate, but, when the climate is hot, it should be 48 hours in cool season and 24 hours in hot season. But, in the case ALERT Hospital, as indicated by respondents, sometimes there a trend in which HCW stay for more than 2 weeks because of the scarcity of vehicles. So off-site transportation is one of the challenges facing the hospital HCWM

2.4.8 Lack of Enforcement of Medical Waste Management Regulations

There must be clearly stipulated rules that apply to all persons who generate, collect, receive, store, transport, treat, dispose of, or handle medical waste in any form. This will help to maintain occupational and public health. Those who generate medical waste must be legally responsible. It shall be the duty of every generator of medical waste (which includes a hospital, nursing home, clinic, dispensary, veterinary hospital, animal house, pathological laboratory,

blood bank) to take all steps to ensure that such waste is handled without any adverse effect to workers and the environment (Tudor, 2010).

Medical waste shall not be mixed with other wastes, and shall be segregated into well labeled containers or bags at the point of generation prior to its storage, transport, treatment and disposal. Apart from the prescribed label, transit containers containing medical waste shall also bear information on the date of generation, the waste category/class/ description, the sender's /receiver's name and address (phone/fax numbers) and the contact person in case of emergency. The label shall also be marked with symbols, such as the universal biohazard or cytotoxic hazard symbol, and warning signs (Blackman, 1996).

Untreated medical waste shall be transported only in a special vehicle owned by a competent authority, as specified by the government. No untreated medical waste shall be kept or stored beyond a period of 48 hours. The municipal body of the area shall continue to pick up and transport segregated non-medical solid waste generated in hospitals and nursing health centers, as well as duly treated medical wastes for disposal at a municipal dump site.

Every generator/occupier/operator shall submit a report to the prescribed authority every year, to include information about the categories and quantities of medical wastes handled during the preceding year. The prescribed authority shall compile this information for future reference. Meanwhile, every authorized person shall maintain records related to the generation, collection, reception, storage, transport, treatment, disposal and/or any form of handling of medical waste, in accordance with these rules and any guidelines issued. All records shall be subject to inspection and verification by the prescribed authority at any time (Griffin, 1990).

2.4.9 Lack of Commitment and Integration

Agencies or assigned government offices to control pollution may lack adequate power and on the other hand lacks commitment. As a result, most of the large hospitals have not complied with these rules. Even the regulatory authorities have to take the blame for not doing enough to ensure implementation. There is lack of coordination between the regulatory authorities (pollution control boards/committees/agency) and department of Health who exercise functional control over all healthcare facilities in one way or the other; and lack of will to

enforce implementation. Or there may not be agency that has been assigned the task of spreading awareness. Moreover Rules have not been publicized as widely as required. Hence, smaller HCUs like public healthcare centers may not be fully aware of them. A number of issues have not been dealt with in detail, such as standards of collection and storage devices, equipment, etc. (Kaiser, Eagan and Shaner, 2001)

2.4.10 Lack of Adequate Facilities

There is lack of adequate facilities for storage, collection; treatment and disposal of health care wastes as well as appropriate technologies have so far been limited in developing countries. Additionally, adequate and requisite number of sanitary landfills is lacking. Therefore, the biomedical waste are openly dumped into the open bins on the road sides, low lying area or they are directed into the water bodies; through which severe disease causing agents are spread into the air, soil and water (Srivastava, 2007).

Self-contained onsite treatment methods may be desirable and feasible for large healthcare facilities but are impractical or uneconomical for smaller institutes.

An acceptable common system should be in place which will provide free supply of color coded bags, daily collection of infectious waste, and safe transportation of waste to offsite treatment facility and final disposal with suitable technology. Moreover available disposal techniques are neither able to meet disposal requirements nor innovations in disposal options are in pace with the evolution of complexity of health care waste streams (Tudor, 20

2.5Lack of awareness or negligence to How to Sort Wastes

The simplest way to identify the different types of waste and to encourage people to sort them is to collect the various types of waste in separate containers or plastic bags that are color-coded and/or marked with a symbol. The international recommendations are as follows:

- **Yellow-** Infectious Culture from microbiology, tissues, blood contaminated materials,
- **Black-**General waste Uncontaminated municipal wastes Green Biodegradables Garden, kitchen and food wastes,
- **Red-** Uncontaminated bottles, pieces of glasses,
- **Blue-** un contaminated Papers, cardboard and office stationeries,

- **Orange**- uncontaminated plastic medicines bottles, plastic bags. (WHO/UNEP, 2005 Color Code Waste Category Contents)

Waste must be collected regularly - at least once a day. It must never be allowed to accumulate where it is produced. A daily collection program and collection round must be planned. Each type of waste must be collected and stored separately. Infectious wastes (categories 1 and 2) must never be stored in places that are open to the public.

The personnel in charge of collecting and transporting wastes must be informed to collect only those yellow bags and sharp containers which the care staff has closed.

They must wear gloves and the bags that have been collected must be replaced immediately with new bags. The wastes can be stored for a week in a refrigerated area (3° to 8° C). Where there is no such refrigerated area, the storage time for infectious medical waste must not exceed 72 hours in winter and 48 hours in summer when it is in temperate climate but when the climate is hot, it should be 48 hours in cool season and 24 hours in hot season (WHO, 1999).

A specific area must be designated for storing medical waste and this area should be closed and access restricted, separated from any food store, protected from rodents and birds , this area should be near to the incinerator and the entrance must be marked with a sign (“No unauthorized access”, “Toxic”, or “Risk of infection”) (WHO, 1999).

2.6 Treatment and Disposal of Waste

The choice of treatment and disposal techniques depends on a number of parameters: the quantity and type of wastes produced, whether or not there is a waste treatment site near the hospital, the cultural acceptance of treatment methods, the availability of reliable means of transport, whether there is enough space around the hospital, the availability of financial, material and human resources, the availability of a regular supply of electricity, whether or not there is national legislation on the subject, the climate, groundwater level, etc.

The method must be selected with a view to minimizing negative impacts on health and the environment. There is no universal solution for waste treatment. The option chosen can only be a compromise that depends on local circumstances.

Where there is no appropriate treatment infrastructure in the vicinity, it is the responsibility of the hospital to treat or pre-treat its wastes.

Research Related Review of Literature

Healthcare waste management includes all activities involved in waste generation, segregation, transportation, storage, treatment and final disposal of all types of waste generated in the healthcare facilities, stages of which require special attention. This will ensure that inputs (Funds, equipment and facilities), activities and outputs (safe workplaces, healthy environment, healthy workers) for the safe handling and disposal of healthcare waste are in place (MOHSW, 2006). Hospital waste handling is a hazardous activity which requires a high standard of training. It calls for specific training that depends on the nature of the work in the hospital, the hazards and possibility of worker exposure, and the responsibilities of individual workers (US-DOE, 1996; Blackman, 1996). Poor hazardous medical waste management is a problem of all developing countries of the world (Manyele and Anicetus, 2006; Manyele et al., 2003).

Environmentally sound management involves taking all practical steps to protect human health and the environment from hazardous wastes, like medical waste.

In an ideal world, this would mean reducing the generation of hazardous wastes to zero. In practice, environmentally sound management means strictly controlling the storage, transport, treatment, reuse, recycling, recovery and final disposal of wastes (UNEP, 2000). When segregated and properly managed, medical waste streams are usually very small in quantity (WHO, 1999). In addition, most waste generated in the healthcare facilities can be treated as regular municipal solid waste except for a varying portion needing special attention such as sharps, pathological wastes, and other potentially infectious wastes, pharmaceutical, biological and hazardous chemical wastes, collectively known as “Special healthcare wastes” and requires proper packaging, storage, transportation and disposal (World Bank, 2000). The lack of segregation between hazardous and non-hazardous waste, an absence of rules and regulations applying to the collection of waste from the hospital wards and the on-site transport to a temporary storage location, a lack of proper waste treatment, disposal of hospital waste along with municipal garbage, insufficient training of personnel, insufficient personal protective equipment and lack of knowledge regarding the proper use of such equipment are among the

problems highlighted in literature are prominent factors contributing to poor medical waste management (Manyele and Anicetus, 2006; Meherdrad et al., 2004).

In Africa, the situation of poor medical waste management is similar in South Africa, Mozambique, Swaziland, Kenya and Tanzania (Leonard, 2003; Manyele et al., 2003, Manyele, 2004a; Manyele 2004b; Manyele and Anicetus, 2006). Illegal dumping is a serious problem in most developing countries. Almost all the countries recognized poverty as a basic factor that dwarfed the success of African efforts in the area of environmentally sound management of hazardous waste.

An additional challenge was the state of the medical waste incinerators of the low operating temperatures (~ 200°C), resulting in excess generation of toxic gases like HCl, CO, co organics, dioxins and furans. Since the locations of these facilities (in hospitals) are usually located in very close proximity of communities, the emissions from the incinerators present a serious health risk to the same community which the hospital is meant (Afr. J. Environ. Sci. Technol).to serve (Manyele, 2004a).

Ethiopian Environmental Pollution Control policy

As stated in Proclamation no. 300/2002, the ministry of environment, forest and climate change of Ethiopia has adopted some national environmental pollution control policy.

According to this policy, no person shall pollute or cause any other person to pollute the environment by violating the relevant environmental standard and if it happens the EPA may take Administrative or legal measures against a person who violates the law or who releases any pollutant to the environment. The measure could be make to clean up or pay the cost of cleaning up the polluted environment in such a manner and within such a period as shall be determined by the authority or by the relevant regional environmental agency. Besides, any person engaged in any field of activity which is likely to cause pollution or any other environmental hazard shall install a sound technology that avoids or reduces or treats the waste to the required minimum level. And when any activity poses a risk to Human health or to the environment, the Authority or the relevant regional Environmental agency shall take any necessary measure up to the closure or relocation of any enterprise in order to prevent harm (FEPA Proclamation no.300/2002).

In general, regarding health care waste management, though, proclamations, guidelines and procedures especially from (UNEP, 2004) have been adopted, their implementation and

regulation are still at its early stage and no significant change is observed. There were some studies conducted on West Gojam public healthcare institute and Gondar area healthcare institutions that dealt with the quantity of healthcare waste generated from each healthcare institution per day by (Azage, 2010). However, the researcher did not find any studied result on assessment of Hospitals' waste management in Addis Ababa particularly in Alert Hospital.

With this foreground, this research has tried to look in to the assessment of the existing healthcare waste management practice, challenges and draw backs and also looked in to the perception of potentially victim groups on unsafe waste management in Alert Hospital.

CHAPTER THREE

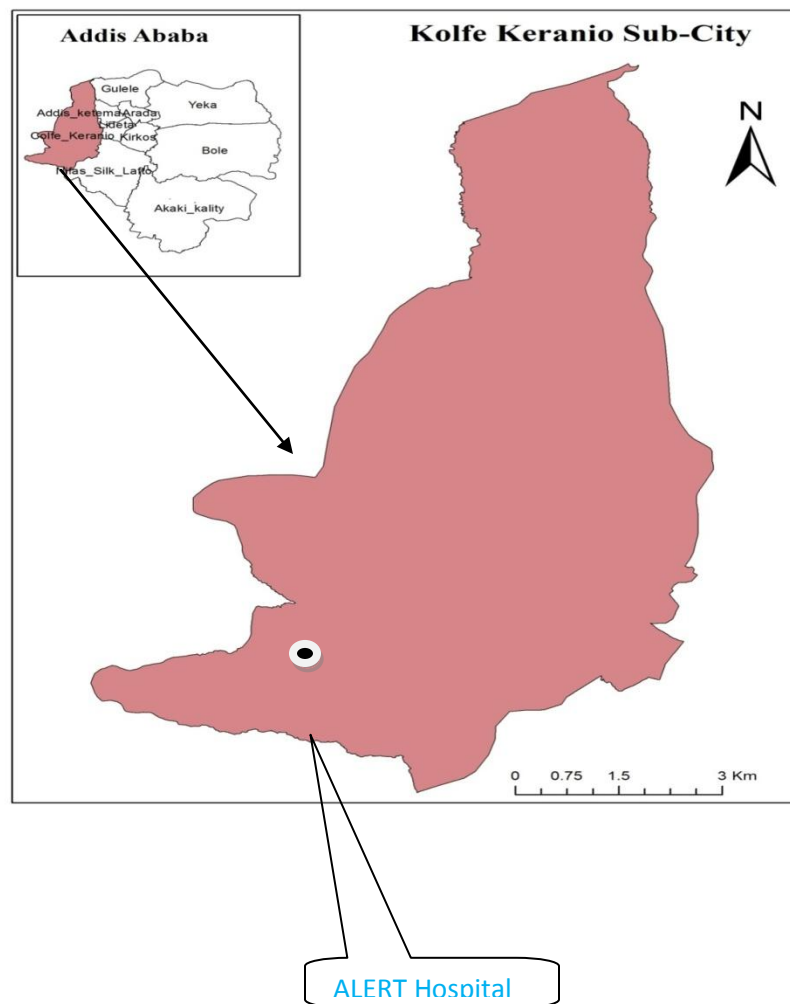
RESEARCH DESIGN AND METHODOLOGY

3.1 Description and Selection of Study Area

Addis Ababa, the capital of Ethiopia and as well as of Africa has been divided in to Ten sub-cities with chartered 2002 and Proclamation no 1/1995. KolfeKeraniyo sub city is one of the sub cities in Addis Ababa found to the East and South east of Burayoutwon (Oromia), West of Lideta and Nifas Silk Lafto sub-cities, North of Sebetatwon (Oromiya) and south of Gulele sub-city.

The study has conducted at ALERT (All Africa Leprosy and TB rehabilitation Training center) Hospital. The German leprosy Relief Association (former *Zenebeworke*) hospital which is found in KolfeKeraniyo .ALERT (*Zenebeworke*) hospital was established in the year 1934 and it was considered the outskirts of the city. The place was rural and there was no settlement at all. Leprosy was widespread and many affected people from the highlands of the northern Ethiopia specifically, Gojjam, Wollo, Tigiray and also from western parts of Addis Ababa & Gurage zone came and settled. They formed a community of afflicted people where they started helping each other in the medical and social services because of the psychological makeup and the stigma due to the condition. When the settlement was thought, the establishment of a hospital to provide medical treatment was considered and finally substantiated in 1934 to be called Zenebwork Memorial Hospital (PZWMH). Princess Zenebwork was one of the daughters of the king (Emperor Haile Silase) and so he decided to give her name to the hospital, and hence the village was also named after her. As a time goes on, leprosy was endemic in almost all sub-Saharan Africa. A manual on the management of leprosy was prepared by the leprologists of the time and disseminated, which by default happened to fall in the hands of some of the African heads of state. When there was a meeting of the African Heads of state in Addis, they influenced the king to open a training institute in order to have a standard leprosy management training initiative. This had ensured the opening of the training division of ALERT by the year 1965. When the hospital service endorsed the training, the name *Zenebwork* Hospital was changed in to ALERT (All Africa Leprosy and TB rehabilitation Training center). The German leprosy Relief Association (GLRA), American leprosy association, British leprosy mission, TLM, the Netherlands leprosy association were among the organizations that were supporting ALERT

financially and technically until 2000 after which they handed over ALERT to the FMOH (Federal Ministry of Health) and pulled out. The government of Ethiopia through the federal ministry of health took over ALERT and integrated the services to the general health organization, adequate budget was allocated, and several departments were opened. The confinement of the leprosy management faded and the service expanded. Today ALERT hospital has a total number of 1350 employees with different educational back ground and occupation. (source: *hospital archive*).



3.2 Research Methodology

3.2.1 Data Type and Data Source

Data Type; In order to conduct this research, the researcher was mainly used qualitative data type.

Data source; for the accomplishment of this research both primary and secondary sources of data were considered. Since firsthand information is more closely related with the problem under study, primary data sources were mainly used. Therefore, the study used primary data from health care staffs, beneficiaries of the hospital.

Secondary data that could support primary sources was collected from published and unpublished documents obtained from different sources. These include research papers, journals, reports, policy statements, proclamations and regulations.

3.2.2 Research Design

Research design is the plan and structure of investigation concerned so as to get answers for the research questions that has been sated at the beginning of the research.

Therefore, this research method was adopted a case study that used the qualitative approaches. Qualitative data which were intended to be collected through method of interview and focused group discussion /FGD/ had been used for purpose of triangulation.

3.2.3 Target Population

The target population of the study was mainly the hospital janitors while other supportive staff members of the hospital were also considered in this study. Not only the hospital workers but also people who were living or working at the distance less than 150 meter radius were also used as source of information of the study. Hence the total number of target population is about 134; the researcher was used 50%, (meaning half of), the total population. Representatives of 15 households were randomly selected from the total of 47 households of the settlers within the radius of 150ms. All of them were above 18.

3.2.4 Sampling Design

The study was tried to assess the waste management practices in the study area. During selection of respondents the janitors of the hospital were the target group. Therefore, the sample respondents (from 134 janitors who were totally females) 67 of them were selected with the help of systematic sampling method, which is one of complex random sampling methods, whereas, for samples of medical personnel beneficiaries and dwellers selection, purposive random sampling method was employed.

3.2.5 Data Collection Instruments

The methods of data collection depend upon the type (qualitative and quantitative) and sources (primary and secondary) of data collection. In this study to collect primary data, interview, focus group discussion and questionnaire distribution was employed and to collect secondary data, websites and external sources were utilized. Hence, both set of methods of data collection employed; special emphasis had been given for the primary data collection tools; as prior research had not been conducted in the area. Therefore, secondary data collection tools were employed to supplement the primary ones. In addition to this, the researcher believes that, employing and using different tools would help for triangulation purpose. The details of each data collection tools used as stated as follow;

Questionnaire: Questionnaire method would be the most important approach through which the primary data in this study was collected. Because the target population group of the research was supportive staff with low level of education, open ended and close ended questions had been prepared to manage the responses in data analysis about waste management practices and challenges of the study area.

Focus Group Discussion: The major targets of FGD in this research were higher officials and heads of different departments of the health care institute. This is because these group could give a better information about the current waste management practice of the study area, what damages are occurring on human health and the environment because of poor handling and management of medical waste. The participants in the focus group discussions comprised of 10 members. The focus group discussion was handled using a checklist. It was held in an assembly hall of the hospital.

Interview: As long as the study focused on current issues, it has to be highly backed by primary data. This information was gathered from the healthcare staffs and beneficiaries. The structured questionnaire expected to focus on drawbacks of proper waste management, awareness of healthcare staffs and beneficiaries about handling and management of medical wastes and what controlling and auditing systems of governmental bodies particularly that of EPA and MOH looks like.

2.2.6 Data Processing and Analysis

Data processing is an important part of the whole survey operation. It includes manual editing, coding, data entry, data cleaning and consistency checking activities. Therefore, data processing phase for the study typically involved tabulation and narration manner of all information to analyze and interpretation. Because of the nature of the issue under investigation, the researcher is going to employ method of qualitative descriptions to present and interpret the data gathered from different sources.

CHAPTER FOUR

4 Data Analysis and Discussion

This research had dealt on the assessment of healthcare waste management in Alert hospital. As discussed in the literature review, 10% to 20% of healthcare wastes are hazardous. Thus, I was passionate to contribute in giving a clue on this regard to minimize the risk of HCW on the populations' health and the wellbeing of surrounding environment.

4.1-Basic Information of Respondent

Table 1. Sex information of respondents

ITEM	Female	%	Male	%	Total frequency
Sex	67	100	-	-	67

Source: field work

As shown in table 1 above, the total number of respondents was females.

As the head of janitors stated, “....our vacancy is open for both sex, but male applicants never appear at all and I think this could be because of the reason that males have a number of chances to generate income. For example, I observed that almost all of the Bajaj drivers around our compound, the majority of taxi drivers and their supporters (weyalas) are males and also males are highly involved in loading and unloading works. So, these could be the main factors for the gender disparity.”

Whatever the reason for the gender disparity of the respondents were the fact on the ground shows that the total number of the sanitary workers in Alert hospital are females. Based on this finding we can conclude that females are the most victims of unsafe health care waste in Alert hospital than males.

Table 2- Educational Back Ground of Respondents

ITEM	Female	%	Male	%	Total frequency
Educational back ground					
Illiterate	-	-	-	-	-
Read and write	11	16.41			11
Grade1-8	27	40.29			27
Grade9-12	18	26.86			18
Certificate	9	13.43			9
Diploma +	2	2.98			2

Source: field work

As shown in table 2 above, regarding the educational level of the respondents near to, 50% of the total respondents was felt below eighth grade, and based on this fact it is possible to say that because of their lesser educational level, the majority of sanitary workers in Alert hospital couldn't have enough information about the negative impacts of HCW and as a result the magnitude of HCW impact could be maximized up on them.

Table 3 Work Experiences of respondent

ITEM	Female	%	Male	%	Total frequency
Work experience					
0-5	59	88.059			59
6-10	5	7.46			5
11-15	-				
16-20	-				
Above 20	3	4.477			3
Total	67	100			67

Source: Filed work

Considering the work experience, though there were individuals under different brackets of work experiences, the majority (88 %) of the survey respondents were within the bracket of work experience under 5 years. As information gathered from different sources of the hospital indicates, experienced janitors used to leave this sector may be for better payment, less exposure and other privileges within and/or out of the hospital compound. As heads of different departments and workers those were at Alert Hospital for a long period of time assured, a number of janitors have upgraded their educational level and changed their position within the Hospital while, others left the compound totally and the janitors who are serving now are also waiting a time until they score a better work experience since the position is using as a spring board for untrained personnel. Since HCW management needs a special attention and a better skill and knowledge which can be achieved through education, continuous training and longer work experience, untrained fresh janitors with low educational level could highly affected by HCW, because of lack of enough information (awareness) due to their low educational level and less work experience.

4.2 The General Scenario of Health Care Waste Management of Alert Hospital

As stated in the infection prevention (IP) guide line, 2004 of Ethiopia, of the total amount of health care waste, about 10 to 20 percent are hazardous. As a result, wastes from health care centers need special attention and proper management. Accordingly, in order to protect the society and the environment from adverse impact of health care waste, the following procedures should be implemented.

- ❖ Prevent spread of infection to the local community and the environment
- ❖ Protect people from accidental injury of waste contaminated sharps and other Contaminations,
- ❖ Prevent the environment from direct pollution.

Source:(IP Guide lines for healthcare facilities in Ethiopia, 2004).

Thus, as the information gathered from different sources of the hospital compound indicates and the researchers' own observation, the general scenario of waste management currently in practice at Alert hospital are organized and explained as follow:-

4.2.1 Segregation: Is a kind of sorting different types of wastes from their very source of generation based on their characteristics.

Respondents from different group of Alert Hospital were asked whether the following waste type are segregated from their source or not and replied as follow.

Table 4- segregation of waste in alert Hospital

Item	Yes	%	No	%	No Answer	%	Total frequency
Infectious	46	68.65	19	28.35	2	2.98	67
chemicals	13	19.4	47	70.1	7	10.44	67
pharmaceutical	29	43.28	36	53.73	2	2.98	67
sharps	53	79.10	13	19.4	1	1.49	67

Source: field work

As shown in table 4 different individuals have different ideas regarding the segregation of different waste types. Therefore, the researcher has compiled and prepared views of respondents on segregation of different types of wastes as follow.

4.2.2 Infectious:- As shown in Table 4.2 above, 69% of the survey respondents confirmed that infectious are segregated from their very sources while 28% of the survey respondents gives witness as even infectious wastes are not segregated about 3% of the respondent don't know whether infectious wastes are segregated or not. This indicates that infectious wastes are segregated in a better manner from their sources though there are some irregularities regarding the segregation of infectious wastes from its source.

4.2.3 Chemical wastes:- as we can observe from the table4.2.1; only19% of the survey respondents said that chemical wastes are segregated properly while 70% of them believed chemical wastes are not segregated and 11% of them do not know whether chemical wastes are segregated or not. This shows that less attention is given to chemical wastes compared to hazardous wastes and concerned bodies are expected to do more on this issue in the same or better way with that of hazardous wastes.

4.2.4 Pharmaceutical: - are wastes which contain medical drugs that are expired, unused contaminated, damaged or non-long needed. Survey respondents asked whether the segregation trend of pharmaceutical wastes is there or not, they replied as follow.

As indicated in table 4.2 above 43.28% respondents confirmed that pharmaceutical wastes are segregated from their sources while 53.73% of them said pharmaceutical wastes are not segregated and still 3% of the survey respondents don't have no information about the segregation of pharmaceutical wastes.

Pharmaceutical wastes like expired medicines, plastic containers and bottles should be segregated, stored in a different place until they are disposed and access should be restricted to unauthorized individuals (*.www.businesswaste.co.uk*)

Thus, as can be observed from respondents reply, it is possible to conclude that pharmaceutical wastes are not segregated properly and in a safe manner. Therefore, the management of the

Hospital and any other concerned bodies should give attention to this point in order to protect human health and the environment.

4.2.5 Sharps:-are forms of bio medical wastes composed of “sharps”, which include any device or object used to puncture or lacerate the skin. (Sharp waste-Wikipedia <http://en.wikipedia.org/wiki/sharp...>)

As shown in table 4.2 above, that 79% of the survey respondents approved that sharps are segregated from their sources while 19% of them still have doubt about the proper segregation of sharp wastes and 2% have no information. Sharps are segregated in to safety boxes known as *biohazard boxes* from their sources of generation and transported to the pit where incineration takes place with their containers.

Based on the information gathered from the survey respondents, sharps are segregated in a better way than any one of the waste types generated in the hospital, though there are still some irregularities. In general, the segregation of sharps is encouraging and better than other types of hazardous waste segregation.

Though there are some initiatives of waste segregation, particularly infectious waste and sharps, the majority of respondents confirmed that, pharmaceutical wastes, chemical wastes and papers are not segregated rather they are combined within the same wastes container and transported to the incinerator.

Thus, only sharps and infectious wastes are segregated in a better way from their sources of generation, even though there are some gaps due to different reasons while all other hazardous and nonhazardous wastes are poorly segregated. This indicates that most of the healthcare wastes with the exception of sharps and infectious wastes, whether they are hazardous or nonhazardous, contaminated or none contaminated, are not segregated properly as can be seen from the survey respondents.

The respondents from in-depth interview and focused group discussants also underlined that with the exception of sharps and some infectious wastes and of course the placentas, all other hazardous and nonhazardous wastes are mixed up within same waste container until they are

finally disposed in the incineration pit and burned all together in the same pit. Then the ash is accumulated in (around) a pit where the wastes are burned.



Fig 1- Open pit (where HCW burn)fig 2-remainder of sharps(syringes)

Though segregation is the first and most important step in healthcare waste management of developing countries like Ethiopia, (as stated in literature), the existing waste segregation system of the Alert hospital, where this research was undertaken, can be taken as poor segregation practice. As it explained in the literature review section, waste should be segregated from their sources based on their nature properly before they are mixed and contaminated. Thus, this is a clear indication that much work is left to be done on this regard.

4.3 Availability of Color Coded Waste Containers

As stated in the literature part, the WHO/UNEP, 2005 identified seven color codes as standard for the identification of different waste containers. Accordingly, respondents have been asked which color codes are in use in Alert Hospital and if other code is used to identify wasteContainers.

Table 5- availability of color coded wastes

<i>Types of colors</i>	<i>frequency</i>	<i>%</i>	<i>Total frequency</i>
Yellow and Black	54	80.59	54
Red, yellow and black	11	16.41	11
Others	2	2.98	2
Total	67	100	67

Source= field work

As shown from Table 5 above, 81% of the survey respondents said that the available color coded waste containers in the healthcare institute are yellow (for Infectious wastes) and black for (municipal wastes) while 2% believed the presence of red colored containers and about 16 % responded that there are different color coded containers. In addition, all of the focused group discussants and in-depth interview respondents also confirmed that there are only yellow and black color coded waste containers in the Hospital. To evaluate whether they are properly using the existing color coded waste containers, or not, the respondents were asked how much awareness do they have and what their trend looks like, and most of the survey respondent and in-depth interview participants approved that they are aware of how to use those color coded waste containers. However, since the containers are open for every one the segregation practice of health care waste in their institute is very poor. Beside to the limitation of resources to segregate and collect wastes in different color coded containers, there is no also proper distinction in using those available waste containers in segregating and collecting wastes due to negligence, poor controlling mechanism, lack of awareness and other related reasons. As information gathered from survey respondents and the researchers' own observation, it is common to find nonhazardous wastes like papers and left food items in the yellow waste container which supposed to be used only for hazardous wastes and hazardous wastes like contaminated gloves could also found in the black waste container which should be used only for nonhazardous wastes.

The problem of Waste management in Alert hospital is not only lack different color coded containers for different types of wastes, but also there is still a gap in application and proper handling of the available color coded containers. Yellow colored waste containers are for infectious health care wastes, whereas, syringes have their own containers known as safety boxes. But all other wastes, weather hazardous or nonhazardous, are found mixed in the same (black) waste containers.

Majority of the focus group discussion participants stated that the main reason for the wrong implementation is poor controlling system of the hospital management and the gap that is made by the environmental protection Authority of Addis Ababa (EPA). Even though, a lot is expected from EPA of Addis Ababa in auditing and controlling the environment issues, it does not play any role in auditing or checking and controlling waste management system and the pollution

impact of Alert hospital. In addition, it is familiar to find the hazardous waste such as contaminated gloves and nonhazardous wastes everywhere of the compound in Alert Hospital particularly around the pit where wastes are burning.



Fig 3 and 4 un-managed and scattered wastes

With regard as to observation of the researcher, except sharps, all the rest types of wastes are segregated in to the same black colored waste container burned in an open pit.

The main challenge for the poor segregation as stated by the focused group discussant and interview respondents is the negligence of staff members in segregating wastes and lack of awareness around beneficiaries.

A randomly selected (10 in number) beneficiaries interview respondent had been asked whether they know the function of these color coded waste container and six of them said;

“.....we know that as the equipments are waste containers, but, we don't have any awareness about the differentiation of their color (which container is for which waste type)” And three of them said “.... we didn't even observe the presence of those equipments you are talking about”. One of the respondent said “....I know these equipment's are waste containers but, I assume that as if they were prepared for the staff use only and I don't know about the use of their colors rather than for a beautification purpose”.

Based on the responses given by the majority of the respondents, it is possible to conclude that none of them know what kind of waste is collected in the black kit and the yellow kit. They either simply drop any kind of waste in the nearly available waste container or reserve themselves from using the containers as stated by one of the respondents. Even there are also beneficiaries who don't have any information about the presence of waste containers due to lack of a day today awareness creation up on beneficiaries.

In general as can be seen from the research data, there is still a gap in using properly even the available color coded waste containers during segregation because of lack of awareness or negligence.

Beside to the scarcity of different color coded waste containers to segregate wastes according to their nature and the standard developed by WHO and Environmental Protection Agencies of different developed countries, in the case of Alert hospital the available containers are not even used properly for different reasons like lack of awareness, negligence and lack of responsible ownership.

As most of the respondents from different sectors of the hospital said, Sharps particularly syringes are segregated into the safety boxes at their very Source of generation. Those sharps are transported directly to the incineration pit when the safety boxes are full.

In addition, placenta is segregated from its source and transported directly to the Placenta pit found in the hospital compound. But as all of the survey respondent said and assured by the sanitary coordinator, the existing placenta pit is not in a convenient situation for janitors and this is because of that the cover of the pit is made of cement and has a very heavy weight and is prepared in a manner that a person is obliged to pull it straight upwards which may expose the person to unpleasant odor which could affect individuals health. As the sanitary department coordinator said, if the cover of placenta pit were made of light material or in a manner that enables a person to open by pulling or pushing side ward rather than picking it up it may minimize the burden of the janitor in addition to save them from bad smell of a pit while opening. Contaminated clothes are disinfected using different detergents and transported to laundry for wash.

All types of wastes those categorized under the so called nonhazardous solid wastes are transported to “KOSHE”, the dump site of the municipal waste of Addis Ababa city. Hazardous like infectious wastes, radioactive laboratory wastes, chemical wastes, and pharmaceutical wastes and sharps with their safety boxes are directly transported to the incineration pit from their source and burned there every day. But as the sanitary workers said “there is challenges in waste segregation process specially around medical doctors and nurse staffs, because most of the time they do not segregate waste properly due to negligence and we are suffering from injuries caused by sharp materials while we are transporting them on our back (since any other means of transportation is not available) and this idea was also confirmed by the Focus Group Discussants.. To describe how much the medical doctors and nurses do not give attention to segregate health care wastes, one of the janitors said “Enersu men aschenekachew, enersuekotemhertalachewYesewulejochnachewu! Egnamenemtemhertyeelen, kesewuyemankoterlinageleglachewuabrenachewalen!”This is to mean, “Why do they worry about waste segregation??? They are educated, they are human beings, and we who are illiterate and don not from the category of human are with them to serve them and to take risk of whatever mistake they do regarding HCWM”.

This is mainly because of lack of feeling of responsibility (negligence) and absence of audit and control from inside or outside. Thus, in Alert hospital, segregation of health care wastes is not implemented properly and the existing waste segregation practice is poor and requires improvement and a lot is left to do by all the concerned bodies (particularly management and medical personnel including the whole staff of the hospital, priority to those who generate the HCWs.)

4.4. Transport: We know that safe transportation of medical waste is one of the crucial measures that should be taken by the health care institutes in order to produce healthy environment and prevent human health from the negative impacts of unmanaged health care waste. The respondents were asked what kind of mechanism they use while transport health care and answered as follow.

Table 6- Health care waste transportation of Alert hospital.

Item	Yes	%	No	%	No Answer	%	Total Frequency
Carts (Wheelbarrow)							
Other types of vehicles							
manual	67	100					
Total	67						67

Source: field work

As it is stated by the survey respondents and researchers' own observation, a number of dust bins are there which are prepared to transport health care wastes. But all of these mobile dust bins are not functional because, most of them are worn out and have no wheels, and the rests are hindered from movement because of lack of convenient road in the hospital compound particularly around the pit of waste incineration is found. As a result janitors are obliged to carry all types of health care waste manually either on their back or on their head. Thus transportation of health care waste is one of the serious problems in health care handling of Alert hospital.

4.5 Treatment: Though it is obvious that treatment of health care waste is environmental friendly than incineration, no practice was going on in Alert hospital as stated by survey respondents and confirmed by FGD.

As stated by different groups of respondents from the hospital, there is no liquid waste treatment mechanism; there is no autoclaving (exception for medical equipments *which is practicing by transporting the equipments to other hospitals*) and no means of recycling health care wastes in Alert hospital.

Thus, the hospital management and other concerned stake holders need to work more on this issue in order to assure safe waste management and protect the society and the environment from the negative consequence of hazardous wastes and generate income or energy by recycling and reusing waste.

4.6 Disposal: It is clear that medicalwaste disposal is one of the biggest day to day challenges faced by health care providers. Thus, it is relevant trying to evaluate what the waste disposal trend of a given health institute looks like while one is assessing the general trend of the health care waste management.

Table: 7 the scenario of healthcare waste disposal of Alert hospital

Item	Y	%	N	%	N/A	%	Total Frequency
Ash pit	4	6	60	90	3	4	67
Incinerator (pit)	61	91	2	3	4	6	67
Outsourced	57	85	6	9	4	6	67
Burring	2	3	64	96	1	1	
Total Frequency							67

Source: Field work

4.6.1 Ash Pit:-As shown from Table – above only 6 %, of the survey respondents know that waste is finally disposed in the ash pit and 4% don't have information whether ash pit is the final disposal of HCW or not in Alert hospital while the majorities (90%) believe that ash pit is not the final disposal. Most of the survey respondents know that there is no Ash pit and the Ash and the remainder of some resistant materials stay at the open pit where the incineration is taking place.

Besides, the focused group discussants also added that there is no ash pit and secure space for disposal of treated wastes. Ash stays at the pit of incineration which is not safe because it don't has lid and is not access restricted. Thus, ash may blow up by wind on the environment and pollutes the environment.

Healthcare institutes need to have enough and well secured and restricted waste disposal place as we can see from different literatures. Open disposal sites in the healthcare center pose infection risks, produce foul odor, attract insects, are unsightly and access to these disposal site is not restricted (Infection Prevention guide line, 2004).

This entails that further work is required to have permanent and secured final disposal areas. Thus, healthcare institutes should have access restricted, enough disposal space, tight lid cover and fenced disposal place as stated in different literatures and in the IP guide line, 2004, Ethiopia).

4.6.2 Incinerator: Information gathered from survey respondents and Focus Group Discussants show that incineration is the only existing means of hazardous waste disposal mechanism in Alert Hospital. But, as stated in the literature section, the incineration of biomedical waste emits CO₂ and N₂O which affects the environment and human health. In addition, as it is stated in WHO, 2002 incineration is the largest source of dioxins and furans which are persistent organic pollutants that are among the most toxic compounds in our environment particularly when plastic containing polyvinyl chloride (PVC) are incinerated and resulted in producing hydrochloric acid that causes acid rain, dioxins, furans and other toxic air borne pollutants that also could spread in to the environment. However in the case of Alert Hospital, as most of the research participants said except the nonhazardous solid waste, all types of wastes including reactive chemicals, radiographic wastes, plastic containing polyvinyl chloride (blood bags, IV sets or disposal syringes) and wastes with high mercury content such as damaged thermometers and used batteries are combined and burned together in an open pit found at only 5m from guards house and some 20m from store. Because, there is no any kind of incinerator and the incineration of wastes is taking place in an open pit with a temperature below the standard, some of the wastes like needles could not be even changed into ash though they are burned they remained sharps and hide in the ash.

Not only this, as all of the participants from the Alert Hospital responded and researcher's own observation, the pit that is in use for the incineration purpose at the hospital is very closer to other service area for example at a distance of 5m from guards house and since it is practicing openly on the ground (in pit) the smoke has no chance to blow over the roof of the surrounding buildings and as a result it stays near to its source of generation and affects the health of people closer to it and the nearby environment. But theories stated that incinerator should be set at a distance of not less than 50 meters from any service giving centers and any other people access areas. As stated by the WHO the degree of temperature for incinerator is recommended to be more than 800oc, but, the degree of temperature for the Alert Hospital is not known and do not have any measurement because the incineration processes is taking place on the ground within an open pit. But the remained materials like syringe and needles can give wittiness as the amount of temperature that the hospital is using is below the required standard.

As the researchers' investigation of field observation and responses of most of the respondents, there is no any kind of incinerator. Except wastes that are relatively sorted out as a nonhazardous type, all types of wastes are burring together within an open pit which is not access restricted for unauthorized individuals. Thus based on this fact we can conclude that more effort is needed in the general activity of waste segregation, collection, treatment and disposal of Alert hospital. Awareness creation, providing proper PPE, having standardized incinerator, preparing access restricted waste awaiting area, construction of standardized road which enables the carts to roll and ash pits are the gaps that should be given emphasis. On the other hand, the interaction of MOH and EPA should have to established on a strong basement in order to work cooperatively since both of them are the concerned government bodies with regarded to waste management and environmental protection as can be found in the experience of different developed countries like Canada (Canadian Coalition for Green healthcare, 2002)

4.7 Assessment of Impacts of HCW Incineration in ALERT hospital on Human Health and Micro Climate of the Surrounding.

Incinerator discharges (including disinfectants and pollutants) occur to air, water and soil. These discharges can lead to occupational and environmental exposures to toxic chemicals and subsequent health risks affecting waste workers, the general public, and the environment. With poor management, infectious risks may also remain, largely in the occupational setting, e.g., waste handlers and incinerator operators (UNEP, 1999).

Health-care waste is a heterogeneous mixture that often contains chlorine (from materials containing polyvinyl chloride and other plastics), heavy metals (from broken thermometers), cytotoxins, radioactive diagnostic materials, infectious materials, pathogens, etc. In consequence, incinerator emissions include both "conventional" pollutants, e.g., particulate matter, sulfur oxides, nitrogen oxides, volatile organic compounds and carbon monoxide, as well as dioxins, furans, arsenic, lead, cadmium, chromium, mercury, and hydrochloric acid. In the aggregate, incinerators can emit significant quantities of gaseous and particulate pollutants to the atmosphere (EPA 1996), and incineration of health-care waste in small and poorly controlled incinerators is a major source of dioxins and furans (UNEP, 1999). Small-scale incinerators generally operate without pollutant controls. Additionally, other design, operation and maintenance issues produce much higher concentrations in stack gases than acceptable in

modern and well-controlled incinerators. Much of the concern regarding incinerator emissions concerns dioxins and furans. General conditions necessary for dioxin formation include the presence of fly ash, organic or inorganic chlorine, and metal ions and, ideally, a temperature range of 250 - 450 C (Huang, 1996). Combustion of sharps alone in small-scale incinerators does not remove all chlorine from the waste stream and prevent dioxin formation since the polyvinylchloride (PVC) seal between the metal needle and the polyethylene body chlorine and the rubber plunger (piston) head of the syringe may contain chlorine (Oka, 2002)

Environment should be kept clean and green by minimizing waste and waste incinerated chemicals to have sustainable environment. Poor waste management in general can jeopardize human health and the environment (Healthcare waste management national guide line, 2008) Even though a number of policies have been adopted to protect environment and human health from pollution caused (particularly that of medical wastes) problems, developing countries are facing a great problem to implement the existing policies and guidelines. Based on this fact, the researcher has discussed with representatives of settlers within the radius of 150ms around the ALERT hospital to assess whether the impact of HCW of Alert hospital is affecting their health condition and their local (micro climate). Accordingly, all (15/15) of the discussant confirm that there is a great problem on their health condition because of the emission from medical waste incineration of ALERT hospital. They believe that since the incineration of ALERT hospital started around their home, many were obliged to leave their own shelter, many were lost their life by different respiratory diseases like TB, and many are still suffering from a number of HCW born diseases particularly that of incineration of HCW on an open land closer to their home. As one of the discussant mentioned majority of the dwellers around the ALERT hospital believe that the presence of this hospital is a curs to them, and to justify why he said it is a "curs", he said

“Majority of the people who are discussing with you right now are victim of the waste generating from ALERTE hospital. We either lost one and more of our families or we ourselves are being suffered by such respiratory diseases r”. The other discussant also said “we all have sacrify a lot because of the presence of ALERT hospital, for example I’m suffering from respiratory disease called TB and other people those I know very well are also suffering by different respiratory diseases including TB, but, no one has go to ALERT hospital to get support, because, it is our enemy, it is the source of our challenge, it is the killer of our children. So, any person never go to ALERT when we get sick, we rather go to

other nearby health institutes like wereda 1 health center and to a traditional medication system called “ tsebel”. The researcher also tried to investigate whether the impact of the incineration of HCW of ALERT caused an environmental pollution or not and the respondents from the selected settlers reacted to the questions “have you observed any change on the climate of your living area and if there is any change what do you think the cause of this change”? And they confirmed that air pollution is reaching to its intolerable stage and we are observing a climate change from time to time. A man who was expected to be a 75 and above years old said “as you are seeing me, I’m a very old person, I never go to lie being at this stage, but, I should have to mention what I know about this village. Before 45 years when I come to this area to live, the area was mainly covered with forest and it had a very suitable type of climate. But now we couldn’t stay even for a few minutes outside because of a bad smell releasing from ALERT hospital. So it is very obvious that the local climate of our surrounding is under change in a very quick manner.”

In addition to the information gathered from the settlers, the researcher also tried to assess whether the patients those are getting service at the moment were from around the ALERT hospital compound and whether they were suffering from such respiratory diseases as mentioned by the dwellers. But, because the address of the users shows only their sub-cities and weredas but not shows from which part of the wereda and the researcher couldn’t identify whether there is any patient was from ALERT area or not.

4.8 Assessment of Level of Awareness in Handling Health Care Wastes

The other expected challenge is lack of awareness. As stated by some of the focus group discussant, since healthcare professionals came through different college training and have some work experience, they might have better awareness how to segregate, collect and dispose hazardous and nonhazardous wastes but due to negligence, irresponsible nature of some individual and poor controlling method of the hospital management, they might not follow the proper segregation procedure

Table 8 - assessment of level of awareness of different stake holders in ALERT hospital in handling health care wastes

Item	Y	%	N	%	N/A	%	Total frequency
Medical personnel	8	80			2	20	10
Janitors	17	25	47	70	3	5	67
guards	2	29	4	57	1	14	7
beneficiaries	-	-	9	90	1	10	10

Source: Field work

As shown from table above 70% of the survey respondents were believed as they have no awareness how to handle health care wastes and also 57% of guards and 86% of beneficiaries confirmed that they were not aware about health care waste management because they didn't get any training or lesson how to manage HCW and even 20% of the medical personnel have no confidence whether they are aware of how to handle health care waste.

However 25% of the survey respondents, 29% of guards and 80% of the medical personnel confirmed that they have some awareness about healthcare waste and their nature.

Regarding to the awareness of HCWM, some of the in-depth interview respondents also strengthen what the 70% survey respondents are assured. They said, "We know some of the hazardous wastes, but, we do not have enough knowledge what is its impact on health and on the environment because of lack of training".

The ten randomly selected beneficiaries have been also asked their awareness about healthcare

Waste and 90% of them replied as "*We do not have any knowledge which type of waste is more dangerous and how can it be handled or managed. We disposed any waste in any waste container which is available nearby*"

In general as we can see from most of the respondents, let alone the beneficiaries, some of the healthcare professionals did not aware of each type of healthcare waste and how to handle them. Therefore, lack of adequate awareness is visible in Alert hospital in managing healthcare wastes that the healthcare facility needs to work on it.

4.9 Assessment of Victims of Unmanaged HCW in Alert Hospital?

As it is stated in Health care Waste Management Guide Line, unsafe health care waste management can affect the environment and human health. But it is obvious that the magnitude of risk could depend up on a magnitude of exposure of an individual to the existing unmanaged health care waste. Thus, the respondents were asked who could be the most victim group to unmanaged health care waste in Alert hospital and replied as follow.

Table 9- victim groups of unmanaged health care waste in ALERT hospital

Item	Yes	%	No	%	No Answer	%	Total frequency
Medical personnel	12	17	54	80	2	3	
Guards	17		42		8		
Beneficiaries	28		35		2		
janitors	65				2		

Source: - field work

As shown in table 9, 80% of the survey respondents believe that of the whole groups that are expected to be victims of the unmanaged health care waste the janitors are the most victim group and this is also confirmed by most of in-depth interview respondents and all of the focus group discussants. The survey respondents were justified their reason why most of them believed that the most victim group is the janitors and one of the respondents said

“I believe that if anything is properly managed from its’ earlier stage no damage could occur and no threat can develop. But since things are not on their right way from their very beginning, they can be source of damage and cause of instability. To make my example very clear to you, even if you keep your child properly at the proper stage, you can make him a right person and good citizen, but, if not, that child can be a burden and threat for you and to the society at all. And accordingly, when I come to the case of our hospitals’ HCWM, it can be the source of threat for everybody who has a direct or indirect contact with it because of the absence of earlier proper handling. But I think the probability of being victim of risk is depending up on the degree of contact that a person may exercise. Thus we (the janitors) are the most victim group of HCW of alert hospital, because, we always involve in segregation, collection, transportation and disposal of HCW, with a very poor PPE or sometimes without any PPE at all. So, no one is there who may come to compete with us in any case to be the most exposed group of unsafe HCW.)

Based on this information it is possible to decide that janitors are the most victim group of the existing unmanaged healthcare waste in alert hospital.

4.9.1 Assessment of Accreditation trends by EPA

Accreditation and certification help to guide healthcare organizations to continuously improve management practices while achieving awareness of the impact of healthcare wastes on the environment, acceptance of responsibility and placement of responsibility for the environment. (Waddington, 2002)

The focus group discussants from the healthcare institute have been asked whether they have been assessed by the Environmental Protection Authority of Addis Ababa about their hazardous waste management methods and accreditation system if any. They said

“regarding to hazardous health care wastes, there is no any interaction between our health institute and the Environmental protection Authority of Addis Ababa. The key informants from Addis Ababa Environmental Authority also confirmed that as there is no interaction between any of health institute and their office regarding HCWM. Thus, the EPA of Addis Ababa does not have any input in environmental protection particularly concerning healthcare hazardous waste and their direct impact on the environment.”

Thus, the EPA and Alert Hospital should work hand in hand and there should be clear demarcation what the role of EPA in controlling healthcare wastes particularly hazardous wastes in respect of the health of the environment.

4.9.2 Major Challenges in Managing Healthcare Wastes

There are many different problems or challenges in managing HCW particularly hazardous wastes as can be seen in the experience of different states. Based on this, the survey respondents and focused group discussants have been asked whether the following problems could be considered as challenges during the implementation of proper healthcare waste management.

Table 10-Major challenges of HCWM in ALERT hospital

	Y		N		N/A		
Item	F	%	F	%	F	%	Total frequency
Poor segregation	52	78	12	18	3	4	67
Problem of transportation	59	88	3	4	5	8	67
Poor control	58	87	7	10	2	3	67
Less motivation	63	94	-	-	4	6	67
Lack of awareness	60	90	6	9	1	1	67

Source: field work

4.9.3Poor Segregation: - As shown from table 10 though, 18% of the survey respondents did not believe that poor segregation is a challenge, the majority (78%) of the survey respondents confirmed that the waste segregation trend of the healthcare institute is poor. Likewise, most of the focused group discussant stated that there is poor waste segregation and as a result all types of waste except the none hazardous municipal waste are dumped and burned together in an open pit. Thus, poor segregation could be taken as one of the challenges in the healthcare institute.

This shows that segregation of wastes do not follow the stated standard in the infection prevention guide line 2004, Healthcare Waste management national guide lines , 2008,Ethiopia and other agencies like WHO and UNEP. This may be concluded as lack of awareness, negligence, poor controlling mechanism and lack of resources, lack of ownership and other related factors.

4.9.4Poor Control: - The majority (87 %) of the survey respondents strongly believed that poorControl is one of the challenges in managing health care wastes in Alert hospital.

The focus group discussants were said that: - though there is assigned personnel to the purpose of environmental control and audit there is no well-developed check list or auditing mechanism, there is no proper control of health care wastes. Of course, we believe that all of the staff members have responsibility, but, the one who particularly assigned to the specific issue should be e accountable for the proper management of wastes.

The department of environmental health was asked why they couldn't play their role or responsibility as it needed and they said that;

“...we made serious struggle more than what is expected from our department to control and the management of HCW in this institute. We wrote letters and we discussed with concerned officials a number of times. But no one can give us ear and we are obliged to stay simply looking the existing problem.”

Thus, poor control is one of the major challenges in managing healthcare wastes in Alert hospital. Though, individual staffs have responsibility in managing wastes, environmentalist is the one who should take all duties and responsibility to take care of the environment and human

health, it is mandatory to assign environmentalist and enabling to be functional in Alert hospital to minimize the negative impact of healthcare wastes on human health and environment.

4.9.5 Poor motivation of the management: -Though some of the focus group discussants did not believe that poor motivation of management is a challenge, most of the focused group discussants believe that there is no motivation not only from the healthcare institute management, but also from the rest concerned government bodies like health office of KolfeKeranio sub-city and even Addis Ababa Health Bureau. If there were motivation from either of the top managements, those huge problems could be at least minimized.

Besides, as shown from table 10 above, 94% of the survey respondents from the healthcare institute confirmed that poor motivation of the top management (of the hospital) is the other mark able challenge in managing healthcare wastes. Thus as we can see from the responses of different respondent groups, it is possible to say that poor motivation is one of the major challenges of Alert hospital regarding the management of healthcare waste.

4.9.6 Problem of Transportation

4.9.6.1 On-site Transportation of HCW

Inside the healthcare facility, wastes must be transported during slacker periods. The itinerary/rout must be planned so as to avoid any exposure of staff, patients or the general public. It must run through as few clean zones (sterilization rooms), sensitive areas (operating theatres, intensive care units) ICU or public areas as possible. This also has the advantage of avoiding the complications involved in the transport of hazardous substances.

Different means of on-site and off-site conveyance may be used to transport healthcare wastes from their very source of generation. On-site transport can be done using wheelbarrows, containers on wheels, carts and other means of transportation. Sometimes healthcare institutes may subcontract their wastes management responsibility to third party for packaging, labeling and transporting outside the healthcare center (Healthcare without Harm, 2011).

In the case of Alert hospital all of the survey respondents responded that there is no any type of means of on-site transport. As it was stated by the survey respondents and researchers 'own observation lack of available road particularly around the pit where the wastes are burned and

lack of proper conveyance obstacle the on-site transportation of healthcare waste in Alert hospital.

Thus, on- site transport is one of the major challenges that the Alert hospital is facing in healthcare waste management processes.



Fig. 5.Example of on-site HCW Conveyance

4.9.6.2 Off-Site Transport

The entity producing the waste is responsible for packaging and labeling the waste to be transported outside the hospital. Packaging and labeling must be in conformity with national legislation on the transport of dangerous substances and with the Basel Convention in the case of cross-border transport. If there is no national legislation on the subject, the [United Nations] Recommendations on the Transport of Dangerous Goods or the European Agreement on the International Carriage of Dangerous Goods by Road (ADR) should be referred to. If a vehicle is carrying less than 333 kg of medical waste entailing the risk of contamination (UN 3291), it is not required to be marked. Otherwise it must bear sign plates.

Where the transport of these wastes is sub-contracted to an external firm, the concerned Government agency must ensure that the carrier is authorized to handle hazardous substances and that it complies with the legislation in force. The organization must furthermore ensure that the wastes will be Cross-border transport (Recommendations on the transport of dangerous Goods sixteen revised, 2009, Canada

According to respondent's responses, Alert hospital practices an off-site healthcare waste transportation system for only wastes sorted as a non-hazardous. But, because of shortage of conveyance sometimes the waste can stay for more than a week and as a result it can be a source of environmental pollution and can also impact human health.

4.9.7 Shortage of Personal Protective Equipment

Mismanagement of healthcare waste implies a combination of improper handling of waste during generation, collection, storage, transport and treatment. Improper handling comprises unsafe actions such as handling without PPE, poor storage, manual transport, use of uncontrolled containers, lack of awareness and training. (WWW.icrc.org, November, 2011)

As stated in literature, improper handlings of health care wastes which can resulted from handling without PPE, poor storage, manual transport and etc... can risk human health and the environment. Thus, as the survey respondents believed and also confirmed by focus group discussants and interview respondents, in Alert hospital there is few or no personal protective equipments. Based on this information the researcher also tried to observe which PPE are available currently, and assured that the cleaners are cleaning the healthcare wastes including the hazardous ones without any plastic apron, heavy duty glove, safety shoe, eye glass, mask, mostly using the normal clothing like apron not made of plastic, different types of shoes which they use during their rest. Based on such findings it is possible to decide that lack (shortage) of personal protective equipment is one of the major challenges that disabled Alert Hospital to have safe handling of health care wastes.

4.9.8 General Comments Related to HCWM of Alert Hospital

Respondents have been asked to put their comments and opinion in relation to the existing system of healthcare waste management of their health institution. After detail reading of all the respondents' responses, I tried to compile all their comments and opinions as follows:-

It is true that the existing HCWM system lacks a lot of procedures to be safe and have safe waste management system. Workers in the healthcare institute have no trust from their working

environment, they are complaining about the health risks that could be posed due to the emission of smoke that comes out from the burning of hazardous waste in an open pit, bad odor from the placenta pits and flying ash.

Beneficiaries, supporting staffs including the janitors and even some of the medical personnel do not have enough information about the nature handling of health care wastes. Thus, education should be given to the beneficiaries and healthcare staffs about the nature of HCW and its handling mechanism like other health educations such as education about HIV, TB, Hepatitis, family planning and others. Of course, in order to have healthy environment and protect the society from risk, this issue should not be left only to healthcare institutes, but also other stakeholders should contribute their role. For instance, the media should take major role in awareness creation about healthcare wastes particularly hazardous wastes like what they do on other health issues like HIV and others.

Hazardous and nonhazardous wastes should be segregated from their source. Wastes that should not be incinerated should be kept out of incineration. Since PPE is one of the preventive methods, they should be available in the healthcare institute without any pre condition. It should not be optional to have PPE for the janitors and other risk exposed staff members.

To minimize health and environmental risk and for better management, hazardous waste management should be transferred to external part.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

Though Health Care Waste Management requires special attention, because of the risk posed on environment and human health in the absence of proper handling, it is poorly handled in Alert hospital. Segregation and treatment of healthcare waste were not well practiced. This study confirms that, the handling, storage and disposal method of solid wastes practiced by the Alert hospital was not proper to protect the environment from contamination and avoid public health risks. Even, during transportation and incineration infectious HCW was mixed with the non-infectious wastes.

Less or no effort is made by environmental protection Authority and waste generators to a better management of the wastes produced from the healthcare institute. And as a result, no sufficient enough effort has made to prevent environmental hazards and associated health hazards caused by health care waste. So there is an urgent need for raising awareness and education on medical waste issues. Besides, this study has made an attempt to identify various technical, institutional, and a social challenges faced by Alert hospital in managing its waste properly and ensuring human health and the environmental safety.

The overall findings of this study depicts that the healthcare institute is not applying proper waste management, has technical, institutional and social problems, concerned bodies are not exert sufficient effort in controlling wastes and protecting human and environmental health. As a result of these challenges, there is no proper segregation, collection, transportation, treatment and disposal of wastes in the HCI. The waste disposal area is not access restricted and some and as a result people are suffering from different respiratory and other diseases. Since the current healthcare waste management practice of the under studied healthcare institute is not safe, it could pose a risk for human and the environment health. There is no adequate supply of resources, lack of guideline implementations for healthcare waste management, and low commitment of HCWs officials were observed. Furthermore, knowledge on healthcare waste type, knowledge on diseases transmitted with contact of infectious wastes, training and availability of guideline documents were significantly associated with healthcare waste

management challenges. Staff members particularly those who have direct contact with hazardous wastes because of their work nature, need have to have the required PPE. However, there is still a gap with this regard and thus, it needs to be worked out. It is because the question of human health and human life.

Though, there are different mechanisms of waste disposals like autoclaving, land filling, outsourcing and others, incineration is one and the most type of waste treatment method in Alert hospital.

However, the existing incineration practice is going on in an open pit prepared on the surface. Though, there are different types of incinerators that could be simply made from metal sheets, bricks and other materials, the health care institute burns different types wastes including the hazardous ones in an open pit located at less than 5 meters from the guards house and less than 20m from the store where a number of workers are working day and night.

Thus, the management of this healthcare institute in particular and the MOH and EPA of Addis Ababa in general need to make policy reformation and much assignment is left to be done to minimize the significant gaps seen in managing Health Care Waste.

5.2 Recommendations

During the conduct of this research, it was observed that the existing management of HCW practice in Alert hospital is poor and faced different challenges. Thus, further work and remedial action from the MOH, EPA and management of the healthcare institute is expected to be implemented on this issue.

The information found in this research would be especially helpful as a guideline for improving and developing the health care related waste management standard criteria in the healthcare institute, in Addis Ababa city and in Ethiopia as well.

Due to the complexity of the situation, poor cooperation among different stake holders and the whole society, poor commitment, and technical problems, many gaps in managing wastes are observed. This should not be methods of choice and thus, institutes and individuals should work as partners rather than adversary to find a long-term sustainable system.

Based on the research findings, I tried to put my recommendations with regard to the existed Health Care Management practice and taking practices of developed countries into consideration.

- ☞ Continuous awareness creation on healthcare waste management should be given to staffs and beneficiaries in order to improve the current practices.
- ☞ Regular and continuous regulation and auditing measure should be done by EPA and Addis Ababa Health Bureau to ensure safe healthcare waste management.
- ☞ Waste Segregation practice should be highly developed at point of generation by all stake holders (medical personnel, supportive staffs beneficiaries and others (if any))
- ☞ The hospital should have clearly stated healthcare waste management guideline and procedures.
- ☞ Further research should be carried out on risk assessment by the concerned government agencies, interested stake holders and researchers.
- ☞ Policy commitment and responsibility for HCWM should be done by all the concerned bodies.
- ☞ Conventions, Rules, and principles should be practiced.
- ☞ The department of environmental health should properly play its role in order to protect the environment and human health from risk caused by unmanaged HCW.
- ☞ EPA and other concerned bodies should exercise the certification system beside auditing and controlling of health institutes.
- ☞ Healthcare institutes need to have standardized incinerator to minimize the risk that pose from the emission of gaseous waste during incineration.

References

- Abdulla, F., Qdais, HA.& Rabi, A. (2008). *Site investigation on medical waste management practices in northern Jordan*. *Journal of Waste Management*.2008,**28**(2):450-458.
- Azage, M. (2010). *Healthcare waste generation and its management system: the case of health centers in West Gojjam Zone, Amhara Region, Ethiopia*. *Ethiopian Journal of Health Development*, 24(2):119-126.
- Blackman, WC. (1996). “*Basic Hazardous Waste Management*”.2nd ed. Michigan:Lewis Publishers, Inc.
- Canadian Association of Physicians for the Environment.(2000). *Greening health care*.Toronto, ON. Canada.
- Canadian Coalition for Green Health Care. (2002). Building green hospitals - A checklist. *Journal of the Canadian Healthcare Engineering Society*, 22(3).15-18.
- Canadian Nurses Association. (2008). *The Role of Nurses in Greening the Health System*.Ottawa, ON. Canada
- Creswell, JW. (2003). *Qualitative, Quantitative and mixed method approaches*. 2nd ed. NewYork: Sage Publications.
- Dale, A. (2001). At the Edge: Sustainable Development in the 21st century. *Environmental Health Perspectives*,109(3):205-207.
- FEPA.(2004). *Biomedical Waste Food Security Guidelines*.Addis Ababa, Ethiopia.
- Foss,C. &Bodil, E. (2002). The value of combining qualitative and quantitative approaches in nursing research by means of triangulation. *Journal of Advanced Nursing*,40(2) 242-248
- Ghauri, P.N.,Grohaug. K. and Kristianslund,I. (1999).*Research methods in business studies- A practical Guide*. New York: Prentice-Hall.
- Griff in RD. (1990) “*Principles of Hazardous Materials Management*” Michigan: LewisPublishers, Inc.
- Hancock T. (2001). *Doing less harm: Assessing and reducing the environmental and health impact of Canada’s health care system*. Canada: Canadian Coalition for Green HealthCare.
- Health CareWithout Harm (2001).*Non-Incineration Medical Waste Treatment Technologies*.
- Health Care Without Harm. (2002). *Dioxin, PVC, and Health Care Institutions*.Washington, DC.
- Health CareWithout Harm. (2002). *The mercury problem: Fast facts*.Washington, DC.
- Health Care Without Harm. (2010). *Leading the global movement for environmentally responsible health care*.Washington, DC

- Healthcare Waste management national Guide lines (2008). Addis Ababa, Ethiopia.
- Houghton, C. & Hancock, TJ. (2004). *Managing medical wastes in developing countries: report of a Consultation on Medical Wastes* Mazurke.
- International Conference on Environment Science and Engineering, (2012), V-32(2012,Singapore)
- Kaiser,B, Eagan P.D and Shaner H. (2001). Solutions to Health Care Waste: Life-Cycle Thinking and “Green” Purchasing. *Environmental Health Perspectives*.2001,**109**(3):205-207.
- Manyele, SV. (2004). “*Medical/hazardous Waste Management for Practitioners*”, Course notes for the BICO Professional Development Program, Prospective College of Engineering and Technology, University of Dareselam.
- Meheret, A. (1999).The City of Addis Ababa: Policy Options for the Governance and Management of a City with Multiple Identities . FSS discussion paper No.2. 56
- Ministry of Health Ethiopia.,(2004). *Infection prevention guidelines for Healthcare Facilities in Ethiopia*. Addis Ababa, Ethiopia.
- Patil A.D. and Shekdar.A.V. (2001).Health-care waste management in India.*Journal of Environmental Management*,20 01, **63**: 211–220.
- Prüss, A. &Townend, WK. (2010).*Teacher’s Guide – Management of wastes from health-care activities* , World Health Organization, Geneva, 1998, .
- Pruss, A., Giroult, E. &Rushbrook,P. (1999).*Safe management of wastes from health-care activities*, WHO.
- Robinson & Tinker (1997).*Reconciling ecological, economic and social imperatives: a new conceptual framework*. In T. Schrecker (ed.), *Surviving Globalism: Social and Environmental Dimensions*, London: Macmillan.
- Rose, A. & Bride, A. (2009). *Coordinating Your Own Waste Audits and Waste Reduction Work*
- Rutala, WA. &Mayhall, CG. (1992) “Medical Waste”. *Infectious Control and Hospital Epidemiology*, 13(1):38–48.
- Sibbald, B. (2001). Crackdown on hospital incinerators coming soon.*Canadian Medical Association Journal*.164 (4). 533.
- Srivastava, SK. (2007). Green supply-chain management: A state-of the-art literature review. *International Journal of Service*, 25):606-615.
- Tudor, TL., Noonan, CL. &Jenkin, LET. (2010). Healthcare waste management: a case study from the National Health Tanzania. *African Journal of Environmental Science and Technology*, 4 (5): 304-318.
- Turner, RK.,Pearce,DW& Bateman, IJ. (1993). *Environmental Economics* (EE)

- UNDP. (2004). *Urban Agriculture: Food, Jobs and Sustainable Cities*. New York: UNDP Urban Harvest Working Paper Series, Paper No. 1.
- UNEP.(1992). *Movements of Hazardous Wastes and Their Disposal*.
- UNEP.(2004). *Stockholm convention on persistent organic pollutants*.
- UNEPA.(2006). *Informal solid waste management*.
- Waddington, K. (2002). Environmental management: A team approach. *Journal of the Canadian Healthcare Engineering Society*, 22(3):10-14.
- WCED.(1987). World commission on Environment and Development.
- WHO.(2010). *Health Care without Harm. Health Care without Harm: Leading the global movement for environmentally responsible health care*.Washington, DC.
- WHO. (2005). *Managing Health Care Waste Disposal: Guidelines on How to Construct,Use, and maintain a Waste Disposal Unit*.
- WHO.(1999). *Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies*.Geneva.
- WHO.(1999). *Safe management of wastes from healthcare activities*.
- WHO.(2009). *Health Care without Harm. Healthy Hospitals, Healthy Planet, HealthyPeople: Addressing Climate Change in Health Care Settings*.WHO & HCWH.

Appendices

Appendix 1: Survey Respondents from the Healthcare institute

Addis Ababa University
College of social science
Department of geography
Survey questionnaire for Janitors

This research is only for the accomplishment of master's degree climate change and adaptation.

The research deals with assessment of healthcare waste management. The researcher understands all confidential issues if any.

Thank you

AberraDiro

ADDIS ABABA UNIVERSITY
COLLEGE OF SOCIAL SCIENCE
DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES
Questionnaires for janitors

Dear respondents, first of all I would like to thank you for your willingness to respond this questionnaire with a sense of belongingness.

Note: This Questionnaire have two types of questions that are open ended and close ended question type. For close ended questions alternatives are available. However, for open ended questions you are allowed to give clear and précised answers. Finally, I want to inform you that to respond your answers based on facts.

1. Respondents background

No	Item	F	M
1.1	sex		
1.2	Work Experience		
	☞ 0-5		
	☞ 6-10		
	☞ 11-15		
	☞ 16-20		
	☞ 20+		
1.3	Educational Background		
	✓ Illiterate		
	✓ Write & Read		
	✓ Grade 1-8		
	✓ Grade 9-12		
	✓ Certificate		
	✓ Diploma		
	✓ Bachelor Degree		
	✓ masters Degree & above		

2-Questionnaire

1 How much awareness do you have about health care waste management?

- a. High b. Medium C. Low d. None

2. Is there any trend that helps you to create or advance your awareness?

- a. Yes b. No

3. If your answer for question number 3 is “Yes”, what kind of awareness creation mechanism is implemented in your organization?

- a. Short term training
b. Reading material
c. Group discussion
d. Others

4. When do you engaged in HCWM training for the last time?

- a. before six months ago
b. before a year ago
c. before certain years ago
d. Only as soon as I hired
e. Others

5. Do you think the awareness creation methods that have been done by your hospital management were successful?

- a. Yes b. No c. I don't

6. If your answer for question number 6 is “Yes”, how much behavioral change have you achieved?

- a. Very High b. High c. Medium d. Low e. None

7. How do you collect HCWS?

- a. always using safety materials
b. always without using safety materials
c. sometimes using safety materials

8. If you are not always using safety materials, why do you not always use it?

- a. lack of interest
b. lack of supply
c. negligence
d. other

9. Which safety materials are available for you to use while cleaning HCWS?

10. How do you transport the HCWS after collecting?
- using my back/head
 - pulling on the ground
 - using some kinds of carts
11. Do you dispose all types of wastes at the same place?
- Yes
 - no
 - some times
12. If your answer for question number 12 is “No”, why do you not put all types of HCWS together?
- to practice the rule of the institute
 - to avoid the risk that could be occurred because of their mixing together
 - Because of the two reasons mentioned above.
 - others
13. Do medical doctors and nurses segregate medical wastes from their very source according to their characteristics?
- Yes
 - No
 - some times
14. Is there color coding practice to segregate HCWS at Alert hospital?
- Yes
 - No
 - I don't know
15. Is there any occasion when medical doctors and nurses put HCW out of containers?
- Yes
 - No
 - I don't know
16. If your answer for question number 16 is “yes”, what could be the reason?
- Lack of awareness
 - lack of time
 - lack of responsibility
17. Is there any regulating mechanism that obliges you to use always your safety materials?
- Yes
 - No
18. Where do await the collected waste before disposal?
-
19. Is the awaiting place in your health care institute access restricted?
- yes
 - no
20. Is there off-site transportation of HCW in your institute?
- yes
 - no
21. What is your opinion about the handling of HCWM in your hospital?
- Very High
 - High
 - Medium
 - Low
 - Very low
22. If your answer is low and very low for question number 22, what is your justification?
-
-
-
23. Do you think that the improper handling of HCW in your hospital create problems upon the staff and/or the beneficiaries?
- Yes
 - No
 - I don't know

24. If your answer for question number 24 is “Yes”, what types of problems have been happened?

25. Is there any measure taken to protect and prevent the impact of HCW in your hospital?

- a. Yes b. No c. I don't know

26. Did you ever faced challenges while you were undertaking HCWM ?

- a. Yes b. No c. I don't know

27. If your answer for question number 27 is “Yes”, what type of challenges did you faced?

28. According to your opinion, who is the most victim group of HCW of Alert hospital?

29. What is your general comment about the waste management of Alert Hospital?

DECLARATION

I declare that “**Assessment of HealthCare waste Management in hospitals, the case of ALERT Hospital**” is my own work and that all the sources that I have used and quoted have been indicated and acknowledged by means of complete references.

Name AberraDiro

Signature _____

Date _____

This thesis has been submitted for examination with my approval as a university

Advisor.

Name Fekadugurmessa (Dr.)

Signature _____

Date _____