



ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES
COLLEGE OF BUSINESS AND ECONOMICS
DEPARTMENT OF PUBLIC ADMINISTRATION AND DEVELOPMENT
MANAGEMENT

Master's Thesis on:
Healthcare Waste Management and Its Pollution Impact in Addis Ababa Bole Sub city
Bole 17 Healthcare Center

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A Thesis Submitted to Department of Public Administration and Management, School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirement for the Degree of Masters of Arts in Public Administration and Development Management specializing in Development Management

Addis Ababa, May, 2014

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Administration and Management (Development)

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ACKNOWLEDGEMENTS

Thanks to the almighty of God who blessed me with cognitive skills to engage my intellectual prowess to go through this passage of master's thesis. The context from which the object of this study examined is my working experience in different hospitals for more than six years, which was a great opportunity to observe many gaps in managing healthcare wastes. Being engaged in a study of this sort is like an adventure without a precedent. Because it concerns mainly with human life and this is so as much of the contemporary contributions in the policy making process and is a clue for other researchers on this regard.

For this I would like to express my sincere and deepest gratitude to my thesis advisor Professor CD-DASH, for his most valuable and insightful comments throughout this research work. Without his constant support, involvement and advice, this thesis would have not been successful.

I would also like to send my appreciation to Dr.Assamenew from University of South Africa Ethiopia branch (UNISA) for his limitless help in editing and advising in all this research works. My humble gratitude also goes to the Bole 17 Healthcare Institute staff members particularly the management committee for their kind cooperation from the beginning of the study till its end.

I have the privilege of being taught the same in my upbringing by my wife, Misrak Seyoum. She has always been the pillar of my strength and the compass of my direction.

To my sister in-law, Sr. Etaferahu Seyoum for her special professional advice and my cousin, Addisalem G/kidan, for his greater effort to bring me different reference materials from his work place University of South Africa (UNISA) Addis Ababa, and Mahlet Delelegn for typing and format designing of this work.

I say your moral support and words of encouragements have always been the reservoir of my strength.

Thank you all

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ABBREVIATIONS AND ACRONYMS

LIST OF ABBREVIATIONS

ADR : Dangerous Goods by Road

LIST OF ACRONYMS

EE : Environmental Economics

EMT : Environmental Management Team

EPAE : Environmental Protection Agency of Ethiopia

FGD : Focus Group Discussion

GAVI : Global Alliance for Vaccines and Immunization

HCC : Healthcare Center

HCU : Health Care Units

HCWM : HealthCare Waste Management

HCW : Healthcare Waste

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 Equipments

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

Abstract

The management of health care waste is of great importance due to its infectious and hazardous nature that can cause undesirable effects on humans and the environment. This study deals with the assessment of the existing practice, challenges and drawbacks of the HCWM of Bole 17 healthcare center. Descriptive research design was used. Both primary and secondary data have been used. Primary data has been collected through the use of questionnaires, interviews, 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 center about the existing waste management practice of Bole 17 healthcare center, interviews conducted with the cleaners of the healthcare center who are the most expected exposed parts. The research data analysis mainly used qualitative data analysis methods using Microsoft excel. The study identifies the existed waste management practice, challenges it faced during the application of the waste management, awareness gaps on segregation, collection transportation and disposal of wastes. The question of how this healthcare center manages its waste is a subject of contestation. The study revealed that the reasons for low performance of HCWM in the healthcare center includes: Poor awareness, shortage of enough and appropriate space for waste disposal, insufficient PPE , lack of Budget ,low standard of incinerator, Poor roll of the EPA and poor implementation and controlling mechanism and absence of certification system. The MOH and EPA in general and healthcare institutes in particular did not give attention to the HCWM unlike the IP and as a result staff members, beneficiaries and nearby residents are facing different health problems 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 wastes management practice by arranging awareness creation program, allotting its own budget, working in collaboration with EPA, and adopting auditing and certification mechanisms ,minimizing or reducing the existed challenges and revising and adopting or developing practical policy.

Mengistu Zelalem

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the study

Health care is where medical activities such as diagnosis, monitoring, treatment and other related activities are taken under the supervision of medical practitioners. Health care disposes huge amount of liquid and solid wastes that may be hazardous to the environment and the public (Blackman , 1996).

“According to the Ethiopian Federal MOH report of 2006-2007, there are a total of 143 hospitals, 690 health centers, 1376 health stations and 9914 health posts run by the Government” (HCWM national Guide Lines, 2008).

Healthcare institutions can be classified as: - academic hospitals, general hospitals, peripheral units and rural hospitals, private clinics and public health centers.

The exponential growth of private and public healthcare institutions in Ethiopia especially since the post 2004 has generated massive healthcare wastes that can cause adverse effect on human health and the sustainable environment.

Healthcare wastes could be solid or liquid wastes arising from public and private healthcare institutes and other health centers. Healthcare wastes may be like sharps, biological wastes, hazardous wastes, infectious wastes, biomedical wastes, pharmaceutical wastes and other healthcare related wastes (Azege, 2010).

What is waste? Waste is differently understood subjectively or objectively by different scholars, sections of societies, countries and in different time ranges and technological level. For more it is seen as a burden but for some like Francisco, it is bread and butter. It is noted in Ackerman and Miza (2000) ”Waste in the inner city; asset or assault”?

Francisco who is a recycler from Peru said: “I believe that sometimes the garbage is a blessing from God in Heaven”. Some throws it away haphazardly and hazardously, while others do it in a pattern integrating into environmental and economic management. If waste is used properly, it is not a burden rather it could be an income.

Ethiopia has poor health status relative to other low income countries, even with in Sub-Saharan African (HCWM National Guide lines, 2008).

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 lead 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)

Since healthcare center's waste disposal practice especially in developing countries pose a huge threat to the public health and the environmental risk, it needs drastic improvement. Policy, procedures, guidelines and codes of practice that are essential to support any healthcare waste management system and as a result to protect the environment from those waste pollution.

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 Ethiopian, 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.

Some of the guide lines that have been directly adopted from UNEP were: Waste generation and administration, Separation and Segregation of sources, Identification and classification of healthcare wastes, Handling and storage, Packaging and labeling, Transportation inside and outside the healthcare, Treatment of wastes and Disposal of residues. are the major guidelines adopted from the UNEP (Biomedical Waste and Food Security Guidelines FEPA, 2004).

The final step in healthcare waste management is disposal. Thus, HCW could be disposed using different mechanisms like:-Incineration, Land filling, Reprocessing or

recycling, Dumping at dumpsites and autoclaving. Of which the very common and recommended disposal method is incineration. Incineration is the process of destroying waste materials by burning “Changing waste to heat”. Among other mechanisms, incineration especially in populated settings is the preferred mode of waste disposal when volume is high and health care waste management sources are limited (WHO, 2005). Incineration is recognized as a practical method of disposing of hazardous waste materials, such as biological medical wastes (UNEP, 2006).

Wastes seldom cope with the actual need for basic facilities and the management of the healthcare waste is an acute problem. Then, the question is how to manage these ever mounting waste problems and related health risks in developing cities, like Addis Ababa? The city of Addis Ababa suffers from a chronic shortage of essential socio-economic services, an awfully inadequate physical infrastructure and unhealthy environmental condition. An inept administration that has failed to maintain, upgrade and expand the city’s infrastructure and services in line with the growing population and economic activity has exacerbated its woes (Meheret, 1999). The urban health problems are practical and risk full in which the inhabitants’ beneficiaries and staffs unfortunately take part in living and working. Some of the inhabitants, beneficiaries and staffs suffer from various infectious diseases.

Healthcare Waste management problems are getting complex as a result of urbanization in Addis Ababa and regional towns of Ethiopia. Population growth, expansion of private and public healthcare centers, lack of proper regulatory mechanisms, poor awareness of the staffs and beneficiaries on the subject or carelessness, incapacitated approach of concerned authority coupled with poor governance are exacerbating the healthcare Waste Management (HCWM) problems. The way HCWM of Bole 17 healthcare center currently handled is unsustainable, shapeless, inefficient, uncoordinated and unrepresentative. The hazardous waste generation in Addis Ababa is increasing, as the trend promises even vigorously fueled by population boom and healthcare centers other business expansion in volume, type, and level of hazard. The understanding of the staffs, nearby community and how they relate themselves to the WM problem is critical.

There are obvious problems in segregation, collection, transportation and final disposal of wastes. The poorly managed open ash and placenta pits are causing air, land and water pollution. The site is posing practical health risks especially to the staffs and

inhabitants surrounding it. It is open for all kinds of scavengers, human beings, domestic and birds. Thus, the HCWM question is critical and needs to be addressed in all its levels from its source to the final disposal including elements of managements and stakeholders' involvement.

There is high and crystal clear pressure emanating from the complicated problem. There is dire need of putting in place legal procedures, introducing appropriate and efficient way of dealing with this challenging problem. And this needs desire, will and resources to bring about a positive and visible change.

1.2 Statement of the problem

HCWM 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.

Ethiopia could be taken as one of the countries hardest hit by the unmanaged disposal of HCW. Even though the improper management of healthcare waste affects the whole society and the environment, People who work at healthcare institute and reside in the vicinity of healthcare centers are the direct victims.

In spite of the Ethiopian Government's commitment to achieve the Millennium Development Goal (MDG) regarding healthcare activities, no significant attention has been given to the healthcare waste management and its pollution impact on the sustainable environment. However, unlike the waste management particularly hazardous waste, infection prevention (IP) has given special attention by MOH and some activities are taking place as stated in the Infection Prevention guide line, 2004.

Some 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. 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 research on public healthcare centers' waste

management particularly hazardous waste management in Addis Ababa and more participatory of Bole sub city.

With this foreground, this research has tried to look in to the assessment of the existing healthcare waste management practice, challenges, drawbacks and its pollution impact and also looked in to the perception of the waste victims on unsafe waste management in Addis Ababa particularly Bole sub city healthcare center.

1.3 Research Questions

The following questions were designed to be answered

- Do staffs of healthcare center and the beneficiaries have sufficient awareness about healthcare waste management and safe handling starting from segregation to disposal?
- What is the existed general waste management practice?
- What waste controlling and auditing mechanism do the MOH and EPA use?
- What are the major challenges in managing healthcare wastes?
- What is the perception of the nearby residents and most victim staffs to the impact of the hazardous health care waste on their health and the surrounding environment?

The study was aimed to contribute something towards the awareness of hazardous nature of healthcare waste, its management methods and its pollution impact on the sustainable environment and health of the society especially people within the health center and nearby residing. It is also hoped that it might fill the gap in the existing knowledge on this regard. Furthermore, it would increase awareness among policy makers on health care waste management and the environment protection, increase awareness among healthcare staff members and beneficiaries about waste segregation, collection, transportation, storage and disposal.

1.4 Objective of the study

1.4.1 General Objective

The general objective of the study was to assess the existing experience of public health centers' waste management practice, challenges and drawbacks and its pollution impact on the victim peoples' health and the surrounding environment.

The general objective also led to the following specific objectives:-

1.4.2 Specific Objective of the study

The specific objectives of the study were to assess:-

- ❖ The general practice of existing waste management system.
- ❖ The awareness of healthcare workers and beneficiaries to the management of healthcare wastes and the toxicity of hazardous healthcare wastes and the due cares they take.
- ❖ How healthcares use identification codes for waste kits/containers
- ❖ The perception of vicinities and expected victim staffs on the unmanaged healthcare wastes
- ❖ The significances of MOH and EPA to control and audit the waste management activities of Healthcare centers and the certification trend, , and
- ❖ The major challenges in managing healthcare wastes.

1.5 Significance of the study

Despite of the fact stated by the (WHO, 2004) 10% to 20% of healthcare wastes are hazardous and healthcare 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 well-operated infrastructures exist. Until countries are in transition and developing countries 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 draw backs with the existing waste management practice and recommended solutions,
- 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 and Limitation of the Study

1.6.1 Scope of the study

This research did not assess the waste generation and risk assessment issues. If the research was conducted on more healthcare centers and assess more issues like measuring average daily waste by conducting case studies, it would be also more meaningful. Thus, the scope of this research is limited only to the assessment of the existing waste management practice and its pollution on the surrounding environment and human health.

1.6.2 Limitation of the study

Due to time and budget limitations, scope of the study was limited only to the assessment of the existing healthcare waste management practice particularly hazardous waste and its pollution impact on the environment and human health of Bole sub city Bole 17 healthcare center (Bole sub city of Addis Ababa capital city(Ethiopia)).

1.7. Organization of the thesis

The first chapter of this study which is the introduction of the research contained; - background of the study, problem 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 the field work of data collection, 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

REVIEW OF LITERATURE

2.1 Definition of key terms

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 (Griff in, 1990).

2.2 General concepts of HCWM

Wastes can be classified as solid and liquid wastes. In general two types of waste streams 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 (WHO, 2004). Some researchers showed that in Canada these wastes stream add up to 500 metric tons (MT) per day of medical waste that enters the environment (James, 2009).

Due to its infectious and hazardous nature, the management of healthcare waste management is of great importance. The improper management of healthcare wastes can cause undesirable effects on human and the environment. 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).

Most healthcare administrators concerned only 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).

A large portion of this waste is incinerated but incineration of biomedical waste emits CO₂ and 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 Rushbrook, 1999 and WHO, 2010).

2.3 Environment

“Environment is sum total of water, air and land interrelationships among themselves and also with the human being, other living organisms and property” (Turner, 1993),

It includes all the physical and biological surrounding and their interactions. Environmental studies provide an approach towards understanding the environment of our planet and the impact of human life upon the environment.

Thus environment is actually global in nature, it is a multidisciplinary subject including physics, geology, geography, history, economics, physiology, biotechnology, remote sensing, geophysics, soil science and hydrology etc (Turner, and Pearce (1993).

2.3.1 Sustainable Environment (SE)

“Sustainable Environment is a development that meets the needs of the present without compromising the ability of the future generation to meet their own needs. Both intra generational equity (fairness among individuals currently alive) and

intergenerational equity (among future generations of individuals) concerns must be met before any society can attain the goal of sustainability” (WCED, 1987).

Maintenance of the regenerative capacity of renewable natural capacity (RNC) i.e harvesting rates should not exceed regenerative rates, and excessive pollution which could threaten healthcare and other waste assimilation capacities and the life support system should be avoided (Turner, Pearce and Bateman, 1993), Environmental Economics (EE)

2.4 Risks of Healthcare wastes on the Environment

Environment should be kept clean and green by minimizing waste and waste incinerated chemicals to have sustainable environment.

Sustainable development can be defined as a process of reconciling three imperatives: (1) the environmental imperatives to live within global biophysical carrying capacity and maintain biodiversity; (2) the social imperative to ensure the development of democratic systems of governance in order to effectively propagate and sustain the values by which people wish to live; and, (3) the economic imperative to ensure that the basic needs are met worldwide. Equitable access to resources – ecological, economic and social – is fundamental to its implementation (Dale 2001; Robinson & Tinker 1997).

The following figure illustrates the continuum for the sector to move towards a fully integrated sustainable health system (Dale 2001)



Fig 2.1 Moving Towards a sustainable Future

Source: <http://sustainableschools.org/discover/what.htm>, 2014 and Dale, 2001

2.4.1. Incineration Risks

In some cases, particularly when wastes are incinerated at low temperature (less than 800°C) or when plastics containing polyvinyl chloride (PVC) are incinerated, hydrochloric acid (which causes acid rain), dioxins, furans and various other toxic air-borne pollutants are formed and spread in the environment. They are found in emissions but also in residual and other air-borne ash and in the effluent gases released through incinerator chimneys. Exposure to dioxins, furans and other coplanar polychlorinated biphenyls can have effects that are harmful to public health.

These substances are persistent, that is to say, the molecules do not break down in the environment and they accumulate in the food chain. The bulk of human exposure to dioxins, furans and coplanar polychlorinated biphenyls takes place through food intake.

And lastly, the incineration of metals or of materials with a high metal content (especially lead, mercury and cadmium) can result in metals being released into the environment (Health Care without Harm, 2001).

2.4.2. Risks Related To Random Disposal Or Uncontrolled Dumping

In addition to the above-mentioned risks, burial and random dumping on uncontrolled sites can have a direct impact on the environment in terms of soil and water pollution (HealthCare Without Harm, 2010).

2.4.3. Risks related to the discharge of raw sewage

Poor management of wastewater and sewage sludge can result in the contamination of water and soil with pathogens or toxic chemicals. Pouring chemical and pharmaceutical wastes down the drain can impair the functioning of biological sewage treatment plants or septic tanks. These can end up polluting the ecosystem and water sources. Antibiotics and their metabolites are excreted in the urine and faeces of patients under treatment and end up in sewage. Healthcare sewage contains 2 to 10 times more antibiotic-resistant bacteria than domestic wastewater, a phenomenon which contributes to the emergence and propagation of pathogens such as MRSA (methicillin-resistant *Staphylococcus aureus*) <http://www.healthcarewaste.org>, 2014

2.5 Strategies To Reduce Healthcares' Wastes And Its Impact On The Environment

Consequently, an important strategy for reducing a healthcare's waste production and therefore its environmental impact is to reduce the amount and toxicity of material that enters the health institutions in the first place. Any sustainable development strategies for the sector should:

- implement waste diversion initiatives to minimize the amount destined for disposal (i.e. waste reduction, material reuse and recycling all eligible materials including electronics);
- create combustion control strategies to improve the performance of existing incinerators;
- use alternative disposal or treatment technologies such as anaerobic digestion of wastes, with recovery of materials and combustion of biogas;
- segregate medical waste to divert materials from the incinerator;
- purchase reusable products instead of the disposable when available;
- audit waste streams to assess the degree of conformity with regards to regulatory compliance, evaluate or demonstrate due diligence, and possible performance improvements;
- minimize radioactive diagnostic and therapeutic materials
- Prevent and compost food service waste , and
- To reduce the environmental impacts from transportation, strategies need to focus on reducing both the total travel required and the intensity of the emissions by using higher efficiency vehicles, alternative fuels or alternate modes of transportation

(Prüss, Giroult, and Rushbrook, 1999).

2.5.1 Green Procurement

An important strategy for reducing a healthcare's waste production and therefore its environmental impact is to reduce the amount of material that enters the healthcare center in the first place. A green procurement policy would alter the purchasing practices of the healthcare center by giving preference to environmentally sustainable products where clinical performance and safety are equal or better (Hancock, 2001).

A green procurement policy needs to:

- ✓ include language about the packing material in the supplier specifications;
- ✓ reduce use of toxic materials;
- ✓ Request rationalized packaging;
- ✓ buy in bulk to reduce packaging;
- ✓ ensure longevity of the product;
- ✓ buy local and seasonal food;
- ✓ procure organic food when possible;
- ✓ eliminate bottled water, and
- ✓ Purchase the least toxic disinfectant and sanitization products available.

2.5.2 Green Teams

The establishment of ‘green teams’ or environmental management teams (EMT) are one way to ensure the implementation of the green procurement strategies for reducing the ecological footprints of healthcare institutions. Green teams play an important role in monitoring and reporting on environmental performance while prioritizing goals and actions plans. The formation of green teams and their inherent management and reporting systems can also contribute to a healthcare’s successful application for accreditation. Accreditation and certification help to guide healthcare organizations to continuously improve management practices while achieving (Canadian Coalition for Green Health Care , 2002).

- ✓ Awareness of their impact on the environment;
- ✓ Acceptance of responsibility for those impacts;
- ✓ The expectation that harmful impacts will be reduced or eliminated, and
- ✓ The placement of responsibility for environmental impacts upon all members of the community (Waddington, 2002).

This compilation represents a key baseline for what needs to be done in order to move to greening the healthcare sector, but this is only the first step in a continuum for change, moving from green to the implementation of sustainable development strategies in all healthcare institutions, to leaders for regeneration. This continuum for change and decision-making is illustrated in Figure 1. 2



Fig2.2.Decision-MakingContinuum

Source: <http://www.nxtbook.com/dawson/marketzone/ghc,2012>

2.6 Challenges to Health Care Waste Management Practices

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). Thus, the major challenges of HCWM that are extracted from different literatures are:

2.6.1 Lack of 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).

2.6.2 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 healthcares.

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).

2.6.3 Poor Regulatory Measures

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).

2.6.4 Lack of Green Procurement Policy

Personnel responsible for procuring health care products and services (materials managers or purchasing agents) come from varying backgrounds. Environmental background or training is not a prerequisite for the individuals responsible for securing health care products and services. Waste minimization can be achieved by purchasing reusable items made of glass and metals which can be disinfected and reused. For example, a polyolefin intravenous IV bag does not contain chlorine, so it has less potential to produce dioxins through incineration than an IV bag containing polyvinyl chloride (PVC). Similarly mercury thermometers can be replaced with mercury free thermometers. Health care units should stimulate the purchase of environmentally preferable products by mandating certain practices in their purchasing policy (Srivastava, 2007)

2.6.5 Waste-Picking and Reusing

Reuse of plastic syringes and other plastic material used in the health care is a thriving business in some countries like India. More than one million people in India are engaged in rag picking (more than 100,000 in Delhi alone). The estimated figure of business on this score in Delhi alone is more than 50 million Indian Rupees per year. Lucrative monetary returns and lack of awareness about the problems associated with biomedical wastes encourage waste-picking and reusing activities. It would not be fair to blame the rag pickers only for this as the circle of connivance starts from the hospital staff itself. It thereafter goes to the waste handlers, then to the rag pickers, to the packaging outlets situated in a decrepit area of a 'basti (slum)', to the medical shop, and finally sold to the unsuspecting patients or their relatives (Shaner, 2001).

2.6.6 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.

2.6.7 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 colour 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, 2010).

2.6.8 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).

2.6.9 Financial Constraints

With dedicated systems being installed in most of the healthcare institutions, financial provision is necessary for capital and recurring expenditure including funds for sufficient manpower, disinfectants, devices and equipment. Normally, a separate allocation of funds for waste management is fundamental for healthcare institutions. Additionally funds are required for conducting training and awareness programs for health care staffs. Smaller healthcare units (HCUs) ignore waste management practices due to financial constraints (Patil, 2001).

2.6.10 Inadequate Awareness and Training Programs

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).

2.6.11 Reluctance to Change and Adoption

Though now alternative technologies are permitted as per the Biomedical Rules, it takes a long time to change the mindset of the people. Even now most of the health care providers and decision making authorities talk of incinerator only although autoclaves and other advanced waste handling equipments are available. Indiscriminate throwing of the waste is still seen in most of the healthcare institutions and the waste handlers still are without protective clothing and gears in some developing countries (Tudor, et al 2010).

2.6.12 Inadequate Pressure from Societies

Society should seriously think about their environmental management programs and exert pressure on improper management of healthcare wastes. There is no doubt in the mind of any educated or enlightened person that improper healthcare waste management is the source of many communicable and infectious diseases. But when it comes to doing anything there is a complete lack of will, and there is a laissez-faire attitude towards the problem (Abdulla, Qdais and Rabi. 2008

2.7 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).

2.7.1 Promote training in healthcare- waste management

Training of health care workers is the core of health care waste management programme to recognize health and safety hazards, and to prevent further exposure to hazards posed by hospital waste. In reality, health care worker training programmes 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).

2.8 Policy Implication

2.8.1 International Agreement

Different types of International agreements on HCWM has been made and adopted during different times. Several international agreements have been concluded which lay down fundamental principles concerning public health, environmental protection and the safe management of hazardous wastes.

Different conventions and principles have been developed like: The Basel convention, the Bamako Convention, the Stockholm convention and different principles like the Polluter pays principle and Proximity principle. These principles and conventions must be taken into account particularly in the planning of hazardous medical waste management.

2.8.1.1 Basel Convention on the Control of Trans boundary

The main objectives of the Basel Convention are to minimize the generation of hazardous wastes, treat those wastes as close as possible to where they were generated and reduce trans boundary movements of hazardous wastes.

It stipulates that the only case where the cross-border movement of hazardous waste is legitimate is the export of waste from a country which does not have the expertise or the infrastructure for safe disposal to a country which does (UNEP, 1992).

This convention aims to reduce the production and use of persistent organic pollutants and to eliminate uncontrolled emissions of substances such as dioxins and furans that are aroused from the unsafe management and poor standard of incinerators (UNEP, 2004).

2.8.1.2 Polluter pays principle

“Polluter pays principle” states that any individual or organization who produces waste is legally and financially liable for disposing of that waste in a manner that is safe for people and the environment otherwise the producer should pay compensation in terms of waste tax and/ or should be legally liable for the amount of waste that is generated.

2.8.1.3 Proximity principle

Hazardous wastes must be treated and disposed of as close as possible to where they are produced. This is because spread of hazardous wastes can be occurred during transportation. This proximity principle was adopted in 1992 by 173 head of states at the Earth summit held in Rio which was agenda 21.

To minimize the generation of waste, to re-use and recycle, treat and dispose of waste products by safe and environmentally sound methods, placing all residue in sanitary landfills were the major points of that agenda.

Measures should be taken as soon as possible to identify populations at risk of exposure to mercury and to reduce anthropogenic wastes. The WHO is ready to guide countries in implementing a long-term strategy to ban appliances containing mercury.

The ISWA (International Solid Waste Association) is an international network of waste treatment and management experts. Its purpose is to exchange information with a view to promoting modern waste management strategies and environmentally sound disposal technologies. The ISWA is currently active in over 20 countries with some 1200 members throughout the world (<http://www.iswa.org>).

2.8.2 National Legislation

National legislation constitutes a basis which must be drawn on to improve waste treatment practices in a country. Many countries are currently drawing up national medical waste management plans. The Global Alliance for Vaccines and Immunization (GAVI) has been financing a project in collaboration with the WHO in this context since 2006, the aim being to help 72 countries including Ethiopia adopt a policy, strategy and plan for managing the wastes generated in health-care activities. There are different actors in healthcare centers who play their own roll in the implementation of HCWM

practices like the waste manager, Healthcare administrator and other waste management experts.

2.9 Duties of the local waste manager

The local waste manager is the person in charge of administering the waste management plan on a daily basis. He is the guarantor of the long-term sustainability of the system and must thus be in direct contact with all the members of the working group and all hospital employees. His duties include: monitoring the collection, storage and transport of wastes on a daily basis; monitoring the stocks of receptacles and containers, bags and personal protective equipment as well as the maintenance of the means of transport used; forwarding orders to the hospital administrator; supervising the persons in charge of collecting and transporting wastes and ensuring the maintenance of storage and treatment facilities are some of the duties of the local waste manager.

2.10 Duties of healthcare administrator

Healthcare administrators also have different duties while managing healthcare wastes. Thus, the healthcare administrator is responsible for ensuring that stocks of consumables goods like (bags, receptacles and containers, personal protective equipment, etc.) are permanently available; examining and evaluating costs, drawing up contracts with third parties (carriers, sub-contractors) and monitoring proper implementation of protective measures are the major activities and responsibility of healthcare administrator.

2.11 Ethiopian Environmental Pollution Control policy

Like other countries, the Ethiopian Federal Environmental Protection Agency has adopted some national environmental pollution control policy as stated in its proclamation no. 300/2002.

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).

2.12 Estimating costs

Healthcare waste management needs its own budget because it incurs costs from the time of segregation to the point of disposal. Medical waste management costs vary widely depending on the context, the amount of waste generated and the treatment methods chosen. A WHO estimate dating from 2003 shows that in a small health-care facility the cost per kg of waste incinerated in a single-chamber incinerator can range from \$0,08/kg to \$1,36/kg.

When cost of HCWM is estimated, investment cost, cost of vehicle, cost of means of transport like wheelbarrow, cost of PPE, staff salaries and training costs and other operating costs should be taken into account (<http://www.healthcarewaste.org>).

2.13 Healthcare Waste Management Principles

Waste management follows steps. The major steps of healthcare waste management as stated in (Infection Prevention Guide lines, 2004, Ethiopia) are: Sorting, collection, Transportation, Treatment and disposal. The major steps that should be followed in managing healthcare waste management are:

2. 13.1 Sorting, Receptacles and Handling

Sorting consists of clearly identifying the various types of waste and how they can be collected separately. There are two important principles that must be followed: Waste sorting must always be the responsibility of the entity that produces them. It must be done as close as possible to the site where the wastes are produced. For example, the nursing staff must dispose of sharps in needle containers located as close as possible to the place where the needles are used so as to avoid any manipulation of used needles. Ideally, the nursing staff will take the needle container to the patient's bedside. Do not put the caps back on syringe needles or remove them from the syringe by hand! It is

much too dangerous to do so. Maintain sorting throughout the chain (in storage areas and during transport).

There is no point in sorting wastes that undergo the same treatment process, with the exception of sharps, which must at all times be separated at source from other wastes.

Sorting is a significant stage in waste management, which concerns all members of staff. Training, regular information and frequent checking are essential if the sustainability of the system that has been established is to be guaranteed.

2.13.1.1 How to sort waste

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 colour-coded and/or marked with a symbol. The international recommendations are as follows:

Table 2.1 Color code WHO/UNEP, 2005

Color Code	Waste Category	Contents
Yellow	Infectious	Culture from microbiology, tissues, blood contaminated materials
Yellow with red strips	Sharps	Needles & IV sets contaminated with body fluids
Black	General waste	Uncontaminated municipal wastes
Green	Biodegradables	Garden, kitchen and food wastes
Red	Glass waste	Uncontaminated bottles, pieces of glasses
Blue	Paper waste	Papers, cardboard and office stationeries
Orange	Plastic waste	Uncontaminated plastic medicines bottles, plastic bags

2.13.2. 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 programme 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).

2.13.3. Transport

Vehicles and means of conveyance

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.

2.13.3.1 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.

An example of an on-site means of conveyance



Fig 2.3 wheelbarrow

Source: 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).

2.13.3.2. 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).

2.14 Waste treatment and disposal

2.14.1 Choosing treatment and disposal methods

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.

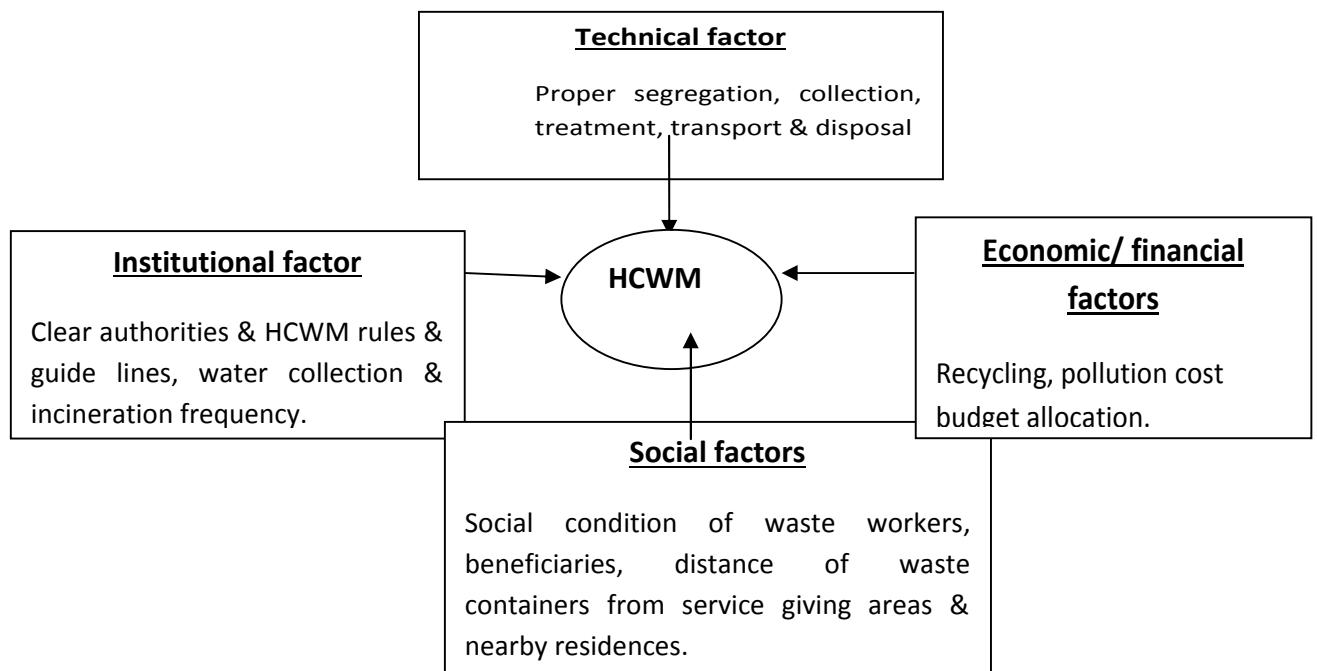
Where there is no appropriate treatment infrastructure in the vicinity, it is the responsibility of the hospital to treat or pre-treat its wastes.

2.15 Conceptual framework

Waste management is a complex task which must go beyond purely technical consultation to institutional, political, social, financial and economical aspects (UNDP, 2004).

Based on literature reviews, discussions with experts, empirical studies, and personal observation, the conceptual framework for the study is developed as follows.

Fig: 2.4. Conceptual frame work



CHAPTER THREE

3.1 RESEARCH DESIGN AND METHODOLOGY

3.1.1 Study area

Addis Ababa the capital of Ethiopia and Africa has been divided in to nine (9) sub cities with chartered 2002 and Proclamation no 1/1995. Bole sub city is one of the sub cities in Addis Ababa found to the East and North east of Addis Ababa. Bole is bordered from the north by Yeka subcity from East by Akaki kaliti and from the south by Kirkos subcity.

The study was conducted at Addis Ababa Bole sub city (17) health center. This sub city covers a larger area around 122.08 square kilo meters and it has 14 districts (woredas) and has a population of 328,900 of which 154,542 are males and the remaining 174,358 are females. **Source:** (www.bolesubcity.gov.et/informations.html, 2013) and Addis Ababa health bureau administration

Bole literarily is known as a place where rich people are residing. The biggest Air port in Africa is found in this sub city. Larger and standardized hotels, guest houses, cinema houses and commercial markets, private and public health centers are found in this sub city. In general it is assumed to be a place where luxury and civilized life is found. Bole is assumed to be a place where cost of goods is high. In this sub city there are nine (9) public healthcare centers. However, like other sub cities in Addis Ababa, the healthcares found in this sub city have problems in managing their healthcare waste and protecting the environment from pollution of these wastes and create negative influence in its sustainability. Thus, the researcher tried to assess the healthcare waste management of healthcare found in this sub city know by the name Bole 17 health center which is found the way from Bole bridge to 22 matoria about 400 meters from Bole TVET school to the west. The health center has about 143 total staffs of which 127 are females and the remaining 16 are males. **Source:** (*Administration archive of the Bole 17 healthcare center*).

3.1.2 Method of Data collection

The study implemented a descriptive research design to obtain information concerning the status of the phenomena to describe, "What exists" with respect to variables or

conditions in a situation. It is also used to answer the questions who, what, where, when and how of the research problem. Therefore, in this study descriptive method of research is a fact finding study; where data obtained from respondents are carefully recorded, described, analyzed, and interpreted by the researcher. This has provided an effective means of assessing the desired information for the study.

Data for this study were collected from a wide variety of sources to present a description of phenomenon or experience from the perspectives of the respondents.

The aim of this research was to assess the current condition of public health center's waste management practice particularly management of hazardous healthcare wastes and its pollution impact on the surrounding environment and the society within and residing to the healthcare center.

The quantitative or qualitative which one is better depends on the research problem and the purpose of the research (Ghauri et al., 1999). Towards this end, both primary and secondary qualitative approach has been used as it is appropriate for assessing the healthcare waste management and its pollution impact on the surrounding environment. It also would enable the researcher to give attention to the selected health center and sample selected respondents taking their experience and exposure.

Among other things, qualitative research occurs in a natural setting enabling the researcher to understand participants' perspective from their stand point (Creswell, 2003). It is also versatile with multiple methods of data collection that are interactive and humanistic.

In the case of staffs of the selected healthcare center, a non probability sampling has been used in selecting the research participants. The participants in the research were health care workers, households at a distance of 150 meters or less to the health centers, key informants from ministry of Health and environmental protection authority and the healthcare service beneficiaries who were patients and their relatives. Respondents from the vicinity or households were head of the household or any family member who were above eighteen years old. Two focus group discussion one from the healthcare institute and the remaining from the vicinity were participated in the research. Besides, two key informant groups one from the MOH and the other from EPA were also participated. Likewise two interview groups one from the healthcare center and the other interview

group from the randomly selected beneficiaries of the healthcare institute were conducted.

This study was tried to describe or assess the trends of healthcare waste management and the impact of those unsafely managed wastes on the surrounding environment and the society live within and the surroundings. Thus, a descriptive type of research design was used.

3.1.3 Sampling Method

The study area consists of a total population of 143 staff members of the selected healthcare institute. Source: (Administration files of the healthcare center). A non probability sampling method was used. This method ensured that there was no biasness in selection of the population who were part of the sample. Out of the total population, 60 staff members (42%) were selected using survey method to be part of the study. In order to put the conversations with FG discussants, Key informants and the in-depth interview, narrative was used and to present the survey responses, I coded all the questions used tables and then analyzed using descriptive method.

3.1.4 Data Collection Instruments

In order to gather the required information from the selected respondents at the healthcare center, MOH, EPA and vicinities in the assessment, combination of both primary and secondary source of data has been used. Primary data were obtained through in-depth interview, observation, survey questionnaires, and key informant and focused group discussants. Secondary data were obtained from archives and administration file of the healthcare institute, MOH and Addis Ababa health bureau. The questionnaires contained both close ended and open ended questions in order to solicit information.

3.1.4.1 In-depth interview

To understand the existing waste management practice fully, the researcher used in-depth interview. To get satisfactory information about the healthcare waste management practice, the perception of the nearby residents about the healthcare waste management and its impact on their health, effort and actions taken by the concerned government officials in managing healthcare waste and protecting the environment from the

pollution impact of this healthcare center waste, in-depth interview with some selected healthcare staff members and some randomly selected beneficiaries has been carried out. Two groups of in-depth interview were held. The first interview group was conducted with seven cleaners of the healthcare institute who are expected to be the most exposed parts. The in-depth interview has been taken place within the healthcare compound while they were on their daily duty.

The second interview group has been conducted with some selected twenty beneficiaries. These twenty beneficiaries have been selected randomly from the daily visitors. The interview was done within the healthcare compound.

One person was interviewed at a time and an average of 20 to 25 minutes per person has been allotted. A tape recorder has been used after consent has been given by the respondents. Interview was conducted based on the prepared interview guiding questions and participants were encouraged to elaborate on a relevant issue to the question. All interviews and discussions have been conducted with the help of prepared semi structured and structured questionnaires.

3.1.4.2 Observation

Observation complemented the research as it enabled the researcher to observe firsthand the way the healthcare waste is segregated, collected, the care that workers take in transporting hazardous waste, burning/disposing waste/ waste collection places and their distance from residing, the healthcare workers' awareness about toxicity of HCW and awareness of healthcare workers and beneficiaries about the color code of waste containers or pits during the segregation of wastes and availability of PPE which are used by the cleaners and other risk exposed staff members.

3.1.4.3 Survey

The selection of survey participants was non probability sampling, *Foss and Ellenfsen (2002)* characterized triangulation as “the use of multiple methods or perspectives for the collection and interpretation of data to obtain representative of reality”. Accordingly, the surveys also would use to triangulate the information obtained from interviews.

A total of sixty (60) questionnaires (there with enumerators) were prepared and distributed. All the 60 questionnaires have been filled up by the respondents from Bole sub city (17) health center staff members (Addis Ababa). Secondary data were gathered

from archival sources such as manuals, Administration sources Journals, and other published and unpublished materials, documents and electronic information resources like internet sources.

3.1.4.4 Focus Group Discussion (FGD)

In order to get wide and detail information, focus group discussion was conducted with two focus group discussants. The first FGD was with top management of the healthcare center. The FGD has consisted of eight members including the representative medical director and other seven department heads and concerned members. The discussion took place at the medical director's office found in the healthcare institute. The discussion took one hour and seven minutes.

The second Focus Group Discussion was conducted with the nearby residents particularly those who are living or working at a distance of less than 150 meters from the healthcare center. These were the expected victims of hazardous and non hazardous wastes produced from the healthcare institute other than the staff members. All those members were eighteen and above years old and were selected randomly. Twelve participants have been participated in this discussion and the discussion has been conducted at a newly constructed building found near by the healthcare center and the discussion has taken fifty six minutes.

3.1.4.5 Key Informant Interview

Two groups of key informants have been participated in this research. The first key informant group was from the Environmental Protection Agency of Ethiopia (EPAE). Three individuals have been participated from the EPA. Out of those three key informants, one was waste management expert and two were from the legal section. The main objective of this interview was to understand and get detail information what the roll of this agency in protecting the environment from hazardous HCW and to understand what kind of controlling mechanisms are developed and used. The discussion was conducted at the legal section of the EPA.

The second key informant was from the Ministry of Health (MOH). Here there was only a single informant from the Infection Prevention case team (IP) section. The objective of this interview was to identify the interaction of EPA and MOF with regarding to the safe management of HCW, the implementation of guide lines and challenges they faced in

implementing safe HCWM. The discussion was held at the MOH at the key informant's his office desk. The discussion took forty two minutes only. Tape recorder was not used here because consent was not given from the key informant.

3.1.5 Data Analysis

The interviews, discussions and surveys were conducted in Amharic. After data were collected, information has been transcribed and translated into English. After reading thoroughly, and identifying emergent themes, the researcher arranged the data in themes. Then questionnaires have been translated in to English. Questionnaires were coded in order to analyze easily and for better accuracy, the codes were recorded in computer excel spread sheet, those codes have been translated into frequency using simple IF clause and then percentage was calculated using this IF clause formula (If (count= cell x, percentage=cell x/total frequency)).

3.1.6 Ethical considerations

It is clear that any research raises ethical issues. Accordingly, care has been taken. The nature of the research and its benefits and the process of data collection (interview) and the estimated time that may take have been clearly explained to the participants. They have been assured of confidentiality of information that they may give if not interested to expose it, consent has been asked prior to interview and privacy has been maintained when required.

3.1.7 Research Setting and organization of the thesis

3.1.7.1 Research Settings

The study has been taken place at Bole 17 healthcare institute which is found in Addis Ababa Bole sub city around Bole TVET School. The study was concentrated mainly on participants selected from and around this health center and residing around this healthcare center, officials from ministry of health and environmental protection authority.

Unlike most of other healthcare centers in Addis Ababa, Bole 17 healthcare center is about 23 years since it was established and its structural design is old. This healthcare center is also found in a very populated area. I have tried to see different healthcare center and observed the location of incinerator, ash pit toilet and available waste

containers, Unlike other healthcare centers in Addis Ababa, this healthcare center has low standard incinerator, ash pit, toilet. Besides, I have tried to get information from some staffs informally and informed me that they have different gaps in managing wastes safely. The passion of the representative medical director (MD) and other department heads also impressed me to stick on this healthcare center. Thus, based on all those points I was initiated to conduct my thesis at Bole 17 healthcare center.

CHAPTER FOUR

4.1 Data Presentation, Discussion, Analysis And Findings

This research had dealt with healthcare waste management particularly hazardous waste management and its pollution impact on the environment. As discussed in the literature review, 10% to 20% of healthcare wastes are hazardous. Thus, the researcher was passionate to contribute something on this regard to minimize the risk of HCW on the populations' health and the environment.

Table 4.1. Socio- Economic Back Ground of Respondents

S.no	Item	F	%	M	%	Total frequency
1	Sex	48	80	12	20	60
2	Age 18-24	24	40	4	7	
	25-30	18	30	6	10	24
	31-34	3	5	2	3	3
	35-40					
	40+	3	5			3
		48	80	12	20	60
3	Educational Level					
	Write and read					
	Grade 1-6	0				
	Grade 7-8	0				
	Grade 9-12	0				
	College diploma	44	73	4	7	48
	Some Bachelor degree	10	17	2	3	12
	Bachelor+	0				
	Total Frequency					60

F=Female, M= Male

Source: Filed work

As shown from table1 above the majority (80%) of the total respondents were females. All the seven in-depth interview respondents who are the most exposed group of the hazardous healthcare waste were also females. While the remaining (20%) of the survey respondents were males.

Although this marked gender disparity may be due to the social attitude that females are appropriate to take care of patients because they are mother hood, they could be also the most victims of unmanaged hazardous healthcare wastes

Besides, three of the eight focus group discussant, two of the key informants from both EPA and MOH were males and the remained seven participants from focus group discussant and key informants were females.

Considering the age composition, though there were different age groups, the majority (40%) of those survey respondents were females within the age bracket of 18 to 24. The age composition of the in-depth interview respondents lied between 30 and 50 age bracket.

It is apparent that more number of the survey respondents was young female nurses which might show that experienced nurses used to leave this healthcare center to other places for better payment and other privileges.

With regarding to educational level, 80% of the total respondents have college diploma and only 20% have bachelor degrees as can be seen from the response of survey respondents. And of course, the educational level of the seven in-depth interview respondents felt below eighth grade. All the focused group discussants and key informants have diploma and degree in different majors.

Thus, from the above table it is possible to conclude that most of the staff members are young and energetic but with less experience and females are greater in number which may indicate females are more appropriate to take care of their patients but also have greater probability to be victim of unsafe hazardous wastes.

4.2. Existing practice of waste segregation, collection and disposal

As stated in the infection prevention guide line, 2004, Ethiopia, only 80% to 90% of healthcare wastes are non- hazardous which shows that 10% to 20% of healthcare wastes are hazardous.

Thus, HCW needs special care and proper waste management and procedures should be implemented to protect health of the society and the environment.

Some of the main objectives of proper healthcare waste management are:-

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

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

Thus, as stated by the in-depth interview respondents (janitors), and other respondents from the healthcare center, the general steps of waste management currently in practice are:-

Segregation: Segregation which is a kind of sorting is an essential component of waste management. It is a kind of activity which is separating different types of wastes in their respective nature.

As most of the respondents said, Sharps particularly syringes are segregated into the available safety box (made of carton materials and some from plastic materials) at their source of generation. Those sharps are transported directly to the incinerator when the safety box is full.

Besides, placenta is segregated from its source and transported directly to the available placenta pit found in the healthcare compound. Placenta is disinfected using different chemicals and directly taken to the available placenta pit found in the healthcare center compound. But the existed placenta pit is not standardized; it has lid but is not access restricted and is very shallow from the surface of the earth. The placenta pit is located not far more than five meters from the treatment and reception rooms while different literatures put as a standard to be located not less than 50 meters. Contaminated clothes are disinfected and transported to laundry for wash.

All other wastes whether non hazardous or hazardous like infectious wastes, radioactive, laboratory wastes, chemical wastes, plastics and papers are collected in a mixed way in the black or yellow coded plastic containers and sometimes wastes could be directly transported in to the incinerator from their source. But as a general procedure, when it is believed that waste pits are 75% full, then they are transported to the incinerator and burned every three days. Sharps are burned there with their containers (the safety boxes).

The focus group discussant also confirmed that, there is no proper waste segregation. The main reason is that, healthcare waste particularly hazardous wastes need special attention and should have owner (the sanitarian). However, in the case of healthcare centers in Addis Ababa and particularly in the case of Bole 17, there is no sanitarian even in the package and no sanitarian is assigned in any of the healthcare institutes found in Addis Ababa. As a result, there is no proper controlling and follow up in managing the healthcare wastes particularly the hazardous waste and segregation is not implemented properly.

This depicts that the existed waste segregation practice is poor and requires improvement and a lot is left to do by all the concerned actors.

Transport; as it is stated by the in-depth interview respondents, though there are some trolleys or carts to transport, wastes are transported manually because the road in the healthcare compound is not suitable to roll the wheels of the carts. It is because the road is made of cobble stones.

The in-depth interview respondents said *“we collect the ash manually and transported to the ash ditch which is the final disposal place found in the healthcare center compound. The ash pit does not have any lid; it is open to the environment. It is not access restricted and does not have any fence and as a result we are suffering from different health problems”*

Treatment: The placenta and some clothes are disinfected using some detergents before they are transported to the placenta pit and the laundry respectively. This is the only kind of treatment made by the healthcare center. There is no liquid waste treatment mechanism; there is no autoclaving and no means of recycling as stated by the FGD and In-depth interview respondents.

Thus, the healthcare management, MOH and other interest stake holders need to work and invest more on this issue in order to have safe waste management and protect the society and environment from the negative consequence of hazardous wastes and generate income or energy by recycling wastes like what other developed countries do.

Disposal: Incineration is the only existing means of waste disposal mechanism in the healthcare center. The incineration of biomedical waste emits CO₂ and N₂O which affects environment and human health as stated in the literature section. In general 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 Bole healthcare institute, as most of the research participants said all types of wastes including reactive chemicals, silver salts, radiographic wastes, plastic containing polyvinyl chloride (blood bags, IV sets or disposal syringes) and wastes with high mercury content such as broken thermometers and used batteries are combined and burned together in the available single incinerator. Some of the wastes like needles could not be even changed into ash even though they are burned and remained sharps hide in the ash.

Not only this, as per the participants' response and researcher's own observation, the existing incinerator is not standardized; it is about six meters long made of bricks and is not liquid proof. It does not have proper cover; it is located inside the healthcare compound at a distance of not more than ten meters from the reception and not more than four meters from the toilet while theories stated that incinerator should be set at a distance of not less than 50 meters from toilet and any other people access areas.

The degree of temperature for incinerator is recommended to be more than 800oc as stated by the WHO, but the degree of temperature for the Bole 17 healthcare's center is not known and do not have any measurement. The incinerator is not access restricted for unauthorized individuals (Researcher's observation).

From this we can observe that more work is left to be done in the general activity of waste segregation, collecting, treatment and disposing. Awareness creation, supply resources, assignment of sanitarian, providing proper PPE, having standardized incinerator and ash pits are the gaps that should be given emphasis. Besides, the interaction of MOH and EPA need to be clearly stated and work cooperatively since both of them are the concerned government agency 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)

4.3. Waste segregation

Survey and in-depth interview respondents were asked whether the following waste type are segregated from their source and was supported by focused group discussants.

Table 4.2. Wastes segregation

Item	Y		N		N/A		Total Frequency
	F	%	F	%	F	%	
Infectious waste	52	87	8	13			60
Chemical Waste	20	33	40	67			60
Pharmaceutical waste	22	37	38	63			60
Sharps	54	90	6	10			60
Radiology	2	3	58	97			60
Bio	4	7	56	93			60
Plastic	12	20	48	80			60
Paper	20	33	40	67			

Y=Yes, N= No, N/A= No Answer, **Source:** Filed work

Infectious wastes:-As shown in Table 3.2 above, 87 % of the respondents confirmed that infectious are segregated from their sources while 13% of the survey respondents believed that even infectious are not segregated. This indicates that infectious wastes are segregated in a better manner from their sources though there are some irregularities duty negligence and poor control.

Chemical wastes:- 33% of the survey respondents said that chemical wastes are segregated while 67% of them said chemical wastes are not segregated. This shows that chemical wastes are not segregated as required and concerned bodies are expected to do more on this issue in order to have healthy community and healthy environment.

Pharmaceutical wastes: - While 37% respondents confirmed that pharmaceutical wastes are segregated 63% of them said pharmaceutical wastes are not segregated. 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 as stated by different literatures and the WHO.

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 MOH and healthcare centers should give attention to this point to protect human health and the environment.

Sharps: - 90% of the survey respondents approved that sharps are segregated from their sources while 10% of them still have doubt about the proper segregation of sharp wastes. Sharps are segregated in to safety boxes from their sources and transported to the incinerator there with their containers (safety boxes).

Thus, sharps specially syringes are segregated in better manner even though there are some irregularities due to different reasons like less awareness, poor control, less commitment, shortage of resources and other reasons.

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, more than 65% of the respondents confirmed that Radiology wastes, Biomedical wastes, plastics ,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 even though there is some gaps due to different reasons while all other hazardous and non hazardous 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 non hazardous, contaminated or non contaminated, liquid or solid 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 non hazardous wastes are mixed up within same waste container until they are finally disposed in the incinerator and burned all together in the same incinerator. Then the ash is transported to the ash pit.

Though segregation is the first and most important step in healthcare waste management, the existing waste segregation system of the healthcare institute can be

taken as poor segregation practice. As it is well known, waste should be segregated from their sources based on their nature properly before they are mixed and contaminated with the other non hazardous wastes. Thus, this is a clear indication that much work is remained to be done on this regard.

4.4. Identification code / color code for marking segregated waste

Waste is collected in different kits that have different colors. As seen in the literature, 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 available in the Bole 17 healthcare center and if other code is used to identify waste containers.

Table 4.3 Identification code / color code for marking segregated waste

Color code used	Frequency	%	Total Frequency
Yellow and Black	42	70	42
Red, yellow and black	14	23	14
N/A	4	7	4
Total	60	100	60

N/A= No Answer

Source: *Filed work*

As shown from Table 3 above, 70% 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 23% responded that in addition to the black and yellow color coded plastic containers, there is also red color coded waste container for bio hazardous wastes. Besides, all members of the focused group discussants and in-depth interview respondents also confirmed that there are only yellow and black waste containers in the healthcare center. Most of the survey respondent and in-depth interview participants from the healthcare institute approved that they are aware how to use those color coded waste containers. However, 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. It is common to find non hazardous wastes like papers in the yellow waste container which supposed to be used only for hazardous wastes and hazardous wastes

also could be found in the black waste container which should be used only for non hazardous wastes.

Thus, beside to the existence of only two common color coded waste containers, there is still a gap in application and proper usage of these two color coded containers in segregation of wastes. All other wastes whether hazardous or non hazardous could be found mixed in same waste containers.

Majority of the focus group discussion participants stated that the main reason for the wrong implementation is poor controlling and lack of responsible body. The other gap is the environmental protection Agency (EPA) does not play any role in auditing or checking and controlling waste management method and the pollution impact on the environment. The focused group discussant also emphasized that healthcare institutes should have sanitarian because sanitarian is the one who have better knowledge about waste management and is the responsible body that could control and lead and organize the waste management team in this case the IP case team.

With regard as to observation of the researcher, all wastes except sharps that are generated in treatment rooms are segregated in to the same color code the yellow or black waste container. The presence of those two color coded containers are not even sufficient. Only sharps are segregated from their source in a safety box which is made of carton and / or plastic materials and transported directly into the incinerator. Those safety boxes are burnt there with the wastes they contain.

The other challenge for the poor segregation as stated by the focused group discussant and in-depth interview respondents is the shortage of resources like different more color coded kits for different wastes, negligence of staff members in segregating wastes and lack of awareness on some staff members and beneficiaries.

A randomly selected twenty (20) beneficiary interview respondents have been asked whether they know the function of these color coded waste. 19 of them do not know what kind of wastes is collected in the black kit and the yellow waste kit. They simply drop any kind of waste in the nearly available waste container. This is because they do not have any awareness about the use of those color coded waste kits.

However, one of the beneficiary male respondents who was 42 years old said:- *“Of course I do not have any knowledge about the meaning or representation of colors, but something is written on the container like “Derek Qoshasha becha” which means only*

for dry wastes and “Tellalafi becha” means for infectious waste only. Thus, I can identify what kind of wastes I should put in the black colored waste container and yellow colored waste container by reading from the labeled waste containers”.

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. 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, the available containers are not even used properly for different reasons like lack of awareness, negligence’s and lack of responsible owner like sanitarian.

4.5 Segregated Wastes are stored before disposal

Wastes are stored in dumpsite or other waste storage place where it is access restricted for unauthorized persons and has cover. Enough and secured storage area is mandatory for healthcare institutes as stated in the literature. Wastes should be accumulated in those storage areas before they are treated or disposed.

However, as to my observation, in the case of Bole healthcare center there is no dumpsite or other means of different waste storage place where wastes are awaited until they are disposed.

Wastes are either directly transported to the incinerator or collected in the available small plastic containers. Respondents have been asked where wastes are awaited until their treatment or disposal

Table 4.4 Segregated Wastes are stored before disposal

Item	F	%	Total Frequency
Incinerator	15	25	15
Plastic Container	30	50	30
Safety box	10	17	10
No Answer	5	8%	5
Total	60	100%	60

F=Frequency,

Source: Filed work

After wastes are poorly segregated as stated above, they are transported to the available plastic containers or waste containers or directly to the incinerator until they are disposed. As shown from table 3.6, above 25% of the survey respondents responded that wastes are accumulated by directly transported to the incinerator while 50% of the survey respondents responded that they are aware that wastes are collected in the available small sized plastic containers found in the healthcare compound. But 17% of the survey respondents said wastes are collected in the safety box while are awaited for disposal and 8% of the respondents do not know exactly where wastes are kept until they are disposed or treated. On the other hand, the in-depth interview respondents also confirmed that since there is no dumpsite or other waste storage in the healthcare center compound, wastes are either directly transported to the incinerator or collected in the yellow and black coded plastic containers for sometimes (three days) and transported to the incinerator for burning. And the focus group discussants also confirmed that the healthcare center does not have any dumpsite or waste storage place. Wastes are collected in the safety boxes, the yellow and black color coded plastic waste containers and when waste containers are 75% full, they are transported to the incinerator.

From this, we can conclude that there is no proper and enough disposal space for waste accumulation where they await until they are finally disposed. Thus, the concerned body should find a mechanism where wastes are kept before disposal or should externalize it if possible or other portable dump area should be available like the municipal waste dump sites.

4.6 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 3.5. Major Challenges in managing healthcare wastes

	Y		N		N/A		
Item	F	%	F	%	F	%	Total
Poor segregation	45	75	15	25			60
Poor strategy	12	20	48	80			60
Poor control	34	57	26	43			60
Less motivation	6	10	54	90			60
Resource scarcity	30	50	30	50			60
Shortage of cash			60	100			60
Lack of awareness	39	65	21	35			60
Poor external pressure	18	30	42	70			60

Y= Yes, N=No, N/A= No Answer, F=Frequency,

Source: Filed work

Poor segregation:- As shown from table 3.6 above 75% of the survey respondents confirmed that the waste segregation trend of the healthcare institute is poor. Thus, poor segregation could be taken as one of the challenges in the healthcare institute while 25% of the survey respondents from the healthcare center did not believe that poor segregation is a challenge.

Likewise, most of the focused group discussant stated that there is poor waste segregation and as a result most wastes like sharps, plastics, papers, other hazardous and non hazardous liquid and solid wastes are dumped together and burned in the incinerator.

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 due to lack of awareness, negligence, poor controlling mechanism and lack of resources, lack of ownership and other related factors.

Lack of strategy:- As shown from table3.6 above 20% of the survey respondents said there is no proper strategy to manage healthcare wastes while most (80%) of the survey

respondents did not believe that lack of strategy is not a challenge in managing healthcare institutes.

Some of the FGD said lack of proper strategy is also the other challenge in managing healthcare wastes particularly hazardous wastes. One of the poor strategies is lack of clearly stated guide line and lack of auditing mechanism or unavailability of developed check lists. From this it can be said that lack of waste management strategy is not such significant challenge in the process of waste management of the healthcare institute but its proper implementation.

Thus, the MOH and other stake holders are expected to more not in designing strategies but proper implementation of the designed strategy.

Poor control:- Though, 57% of the survey respondents strongly believed that poor control is one of the challenges in managing hazardous and non hazardous wastes 43% of them did not take poor control as a challenge.

The focus group discussant from the healthcare institute said that: - since there is no assigned sanitarian and no well developed check list or auditing mechanism, there is no proper control of hazardous and non hazardous wastes. Of course, we believe that all the staff members have responsibility but there should be someone accountable for the proper management of wastes.

Though, the focus group discussant said that they do not have any information why sanitarian is not assigned or do not have included in the health package, a key informant from the ministry of health (MOH) stated that there is sanitarian in the package but due to shortage of budget and other related problems, some sections are phased out and budget might be transferred for some urgent issues or departments.

Thus, poor control is one of the major challenges in managing healthcare center particularly in the case of Bole 17 healthcare center. Though, individual staffs have responsibility in managing wastes, sanitarian is the one who should take all duties and responsibility and it is mandatory to assign sanitarian on each healthcare institutes to minimize the negative impact of healthcare particularly hazardous wastes on human and environmental health.

Poor motivation of the management:- Even 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 center but also from the MOH. If there was motivation from either of the top managements, those huge problems could be at least minimized.

Besides, as shown from table 3.6 above, only 10%% of the survey respondents from the healthcare center confirmed that poor motivation of the top management is the other mark able challenge in managing healthcare wastes while the majority (90%) still do not believe poor motivation is not the factor for the existence of poor waste management trend.

Here we could observe that there is mixed attitude between the focused group discussant and the survey respondents. i.e while majority of the focused group discussants believed that there is poor motivation, most of the survey respondents believe that there is motivation and is not taken as a challenge in managing wastes.

Shortage of resources:- Though the representative medical director of the healthcare tried to resist, most of the focused group discussion participants said lack of available resources is one of the challenges. For example the healthcare center does not have plastic apron and cleaners are faced different health problems. Besides, all seven of the in-depth interview respondents strongly argued that there is no enough PPE resource, *“we do not have plastic apron, we do not have mask, we do not have safety shoes, we do not have eye protective glass and even the available heavy duty gloves are not standardized. It is difficult to say that we have PPE. As a result we are suffering from different problems like:- injury from sharps, blood may sprinkled on our eyes, different respiratory disease like sinus and common cold, bad odor from the toilet and placenta pit”*.

Indeed, 50% of the survey respondents also strengthen the idea of most focus group discussants and in-depth interview respondents while 50% of the survey respondents shared the idea of the representative medical director.

Thus, though half of the survey respondents do not sense the shortage of PPE resources, the most suspected victim of hazardous wastes (Janitors) and 50% of the survey respondents strictly believe that there is shortage of resources and as a result they are

facing different problems. This indicates the MOH or other concerned party should revise this issue and should take major action to correct this problem. This is a very sensitive issue because it deals with human life and therefore, the concerned Government bodies should give special attention to correct this challenge at any cost.

Lack of cash:- shortage of cash also could be taken as a challenge as emphasized by some of the focused group discussants (FGD) and they said *“No budget is allotted for waste management and we have deficit. If we could have enough budget or cash; it would be possible to have standardized incinerator, standardized placenta pit and ash pit and standardized waste awaiting space. Thus, shortage of cash is also one of the challenges in our healthcare center”*.

Some of the interview respondents agreed with the idea that there is shortage of cash however 100% of the survey respondents do not assume shortage of cash is not a problem in this healthcare institute.

This is therefore, though there may be minor challenges because of shortage of cash, it cannot be taken as a major problem to have unsafe management of hazardous wastes.

Less Pressure from society:-The focus group discussant from the healthcare center said there is some external pressure particularly from the neighbor hoods but it is not in organized way and is not significant.

Most of the focus group discussant from the healthcare center said *“We understand that problem is created to the nearby residents because of the unsafe smoke from the incinerator, but it difficult to take action since we do not have any option. There might be some alternatives like relocating or externalizing the waste management service to third party, establishing underground incinerator or having portable incinerator may be some of the options. However, it is beyond the scope of the healthcare to allot budget for such kind of options and is not even within the mandate of the healthcare institute’s management”*.

Likewise the focus group discussants from the vicinity entirely confirmed that they have raised their claim particularly about the smoke pollution that comes out from the incinerator for several times. And they said *“We have claimed so many times particularly about the incinerator smoke and the management has promised to relocate the incinerator or takes other option. However, they did not take any action till then. We*

are exposing to different health problems because of the polluted smoke released from the incinerator that comes out through the chimney and we are also suffering from the bad odor of the toilet located near by the incinerator”.

Some of the survey respondents (42%) gave their witness that claim has been raised in different times from the neighborhood residents while majority of the survey respondents 58% of the survey respondents were not aware of the external pressure about the unsafe healthcare waste management.

There is some pressure from the external society particularly from neighbor hoods who are exposed for different health problems because of the unsafe management of healthcare waste but not in a well organized manner.

Thus, exposed societies should make their voice to be heard which might help even the healthcare officials and concerned authorized individuals to give attention to the negative consequence of healthcare wastes particularly the polluted smoke that comes out from the incinerator.

Lack of awareness:-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 non hazardous wastes but due to negligence, irresponsible nature of some individual and poor controlling method of the healthcare center, they might not follow the proper segregation procedures.

As shown from table 3.6 above 65% of the survey respondents also ensured that they were not aware about waste particularly healthcares' hazardous waste management. However 35% of the survey respondents confirmed that they have some awareness about healthcare waste and their nature.

The seven in-depth interview respondents (janitors) also strengthen what the 65% survey respondents are assured. They said, *“we know some of the hazardous waste and have some awareness about their nature and how to handle. However, we do not have enough knowledge what is its impact on health, on the environment and how to handle and treat”.*

The twenty selected beneficiaries have been also asked their awareness about healthcare waste and replied as “*We do not have any knowledge which type of waste is more danger and how can it be handle or managed. We disposed any waste in any waste container which is available nearly*”.

In general as we can see from most of the respondents, let alone the beneficiaries most of the healthcare professionals and janitors did not aware of each type of healthcare waste. There is lack of awareness and therefore, it can be taken as one of the great challenges in managing healthcare wastes particularly the hazardous wastes that the healthcare facility need to work on it.

4.7 Awareness / education

To go beyond awareness is one of the challenges, respondents were further asked about their training or awareness education about wastes

As shown from Table 3.7 below only 23% of the survey respondents said they did get training or awareness about healthcare waste management while the majorities (68%) of the respondents were not given any training which is also strengthened the lack of awareness is one of the challenges as stated in Table 6 above. On the other hand 8%% of the survey respondents did not response.

Table 4.6 Awareness / education

Y		N		N/A		F
F	%	F	%	F	%	
14	23	41	68	5	8	60

Y=Yes, N=No, N/A= No Answer, F=Frequency

Source: Filed work

With regard to the in-depth interview respondents, two of the in-depth interview respondents confirmed that they have got education about healthcare waste management two years ago while the remaining five janitors said they never get any training or education how to manage healthcare wastes particularly hazardous wastes.

Twenty beneficiaries have been randomly selected and interviewed whether they have any education or awareness about hazardous and non hazardous wastes and their knowledge of waste segregation. Most of the survey respondents from the beneficiary

expressed that they do not have any knowledge how to segregate wastes, They are not aware which waste pits are used for hazardous and which one is for non-hazardous, rather they simply drop any waste in any nearly available waste pit. However, only one beneficiary respondent expressed *“Of course I have never get any education about waste segregation and disposal during all the times I came to this healthcare center but there is written identification in the waste pits and anyone who can read might identify what type of waste could be collected in which waste container. I for example have some awareness which waste should be kept in the black container and which in the yellow one, because I can read and I have some medical background. But I do not believe that is explanatory for all beneficiaries. Thus, education like other health education should be given in order to create some awareness among the beneficiaries about wastes particularly hazardous wastes and their segregation methods”*.

Despite of the survey respondents' and focus group discussants' response that they do not have any scheduled awareness creation education, a key informant from the MOH stated that healthcare waste management has its own package and there are different training manuals prepared for different professionals in the healthcare centers. There is education manual for physicians, for beneficiaries, for other healthcare professionals, top administrators and for cleaners. The ministry of health gives training in different times for trainers about healthcare waste management based on the healthcare waste management national guide lines. Trainers are expected to give training for their subordinates and for beneficiaries how to segregate, collect and dispose wastes particularly hazardous wastes and their negative impact on human health. However due to scarcity of skilled human resource and material resources, we do not have such an auditing mechanism about their performance. Besides there is no any developed controlling mechanism or auditing guide line until then. However, some check lists particularly check lists for hazardous wastes are on process to develop and it is believed that there will be standard check lists in the near future. (Respondent from MOH).

Even though, the healthcare institute has health education every two weeks with beneficiaries, it does not have any programmed education about waste and waste management. Beneficiaries do not have matured knowledge about waste type, waste segregation, collection and disposal. Thus, they believe that awareness creation should be one of the preventive mechanisms and awareness should be created not only among healthcare staff but also among beneficiaries.

The representative medical director also emphasized that awareness creation should not be let only to the healthcare centers or MOF; medias also should play their own role like what they are doing in other disease prevention in HIV, TB and others.

From this it can be understood that there is a communication gap between the MOF health and healthcare centers. This is because, though, there is waste management guide line as stated in the literature and training program scheduled by the MOH, healthcare centers do not aware this program and do not get training about waste management. Besides, the MOH does not have any prepared standard check list and controlling mechanism and a lot is expected to be done on this issue by any of the concerned parties.

4.8 Vaccination of Hepatitis A,B and Tetanus

As it is well known and stated in the literature, healthcare staffs particularly those who have direct interaction with hazardous wastes, should be vaccinated hepatitis and tetanus.

Table 4.7 Vaccination of Hepatitis A, B and Tetanus

Y		N		N/A		F
F	%	F	%	F	%	
16	27	41	68	3	5	60

Y=Yes, N=No, N/A= No Answer, F= Frequency

*Source: **Filed work***

As shown above from table 68%% of the survey respondents said that they did not get any vaccination of neither Hepatitis A and B nor Tetanus whereas only 41% are vaccinated and 5% of the survey respondents did not say anything.

Unfortunately, only two of the seven in-depth interview respondents from cleaners were vaccinated while the remaining five were not vaccinated. One of the cleaners was even savaged by hepatitis B and she had been suffered for more months and had sought cure for it.

Thus, despite of its dangerous nature and its human being concern, staff members especially those who are expected to be victim because of the nature of their work

position need to be vaccinated. A special attention should be given to this point and the healthcare center needs to revise its existing system with this regard.

4.9 Waste Management Committee (Green team)

The establishment of green team or environmental management team ensures the implementation of the green procurement strategies for reducing the ecological foot prints of the healthcare institution. The formation of green team and their inherent management reporting system could also contribute to healthcares successful application for accreditation as stated in the literature by (Waddington, 2002)

Likewise, Green team committee is a team composed of different professionals from different department concerned on healthcare waste management in relation to the safe environment (Waddington, 2002)

As can be seen from the table 3.9 below, 50% of the survey respondents said there is a committee called IP committee composed of eight members from different departments of the healthcare institute and, 38% of the survey respondents confirmed that there is no green team or committee that aims protecting the environment from healthcare waste but there is IP committee its target to work only on disease prevention without having particular consideration to the waste management and its pollution impact.

Table 3.8. Waste management committee (Green team)

Y		N		N/A		F
F	%	F	%	F	%	
30	50	23	38	7	12	60

Y=Yes, N=No, N/A= No Answer, F= Frequency

Source: Filed work

And 12% of the survey respondents did not have any information whether there is waste management team or not.

Ended, most of the focused group discussants also agreed with the idea of the survey respondents and reported that: - there is committee which is called infection prevention team composed of different peoples from different departments. The concern of this committee or the main function of this team is to follow up the implementation of

infection prevention package and give health education to different group of peoples from the beneficiaries and healthcare professionals in the healthcare center.

As to the researcher's observation, there is a committee called IP case team which overviews and follows the infection prevention activities but do not have any concern or role on the waste management and environmental protection with regard to the healthcare waste pollution.

Thus, healthcare institutes need to have green team in order to protect the environment from the impact of healthcare waste particularly from hazardous wastes. The role of the IP committee should be clearly stated and segregated from the role of green team or this IP committee should do something to protect the environment from hazardous HCWs acting as green team. And of course, the green team also has its own role to implement the green procurement as it is stated by Canadian coalition for green healthcare, 2002.

4.10 Existence of procedures /guide lines /for collection and handling of wastes

Though a key informant from Ministry Of Health (MOH) Ato Same expressed that they have standard healthcare waste guide line prepared and enacted in 2008, some of the focused group discussants said we did not aware of the said HWM Guideline. However, there is a single chapter about healthcare waste management in the infection prevention national guide line manual.

Table 4.9 Existence of procedures /guide lines /for collection and handling of wastes

Y		N		N/A		F
F	%	F	%	F	%	
14	23	39	65	7	12	60

Y=Yes, N=No, N/A= No Answer, F= Frequency

Source: **Filed work**

As shown from Table 3.10 above, only 23% of the survey respondents said there is guideline about healthcare waste management while 65% of them said that there is no clearly stated guide line about healthcare waste management and 12% did respond nothing.

The researcher also observed that there is IP manual which incorporates a single chapter that states some points about healthcare waste management. However, a key informant

from MOH (Ministry of health) said there is a particular guide line about healthcare waste management developed in 2008.(Healthcare waste management national guidelines,2008). Despite of the existence of the HCWM guide line at the MOH, concerned officials from the Bole 17 healthcare institute insist that they do not have any information about this guide line.

There is communication gap between the MOH and healthcare centers because the researcher also observed that the guide line is available in the MOH but not in the Bole 17 healthcare center except the single chapter in the IP manual.

Healthcare waste management guide line is not only important but also a devise for accountability.

Thus, the existed HWM guide line should be available to all healthcare institutes and needs to be implemented at all levels of the healthcare facilities. Healthcare institutes need to have clearly stated procedures how collect, segregate and dispose wastes and should have to have owner who is responsible and accountable like sanitarian as stated in the literatures.

4.11 On-site transportation of HCW

Different means of on-site and off-site conveyance may be used to transport healthcare wastes from their very source. 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 transported outside the healthcare center (Healthcare without Harm, 2011).

Respondents from Bole healthcare center have been asked whether they have off-site transportation of hazardous healthcare waste and responded as follows.

Table 4.10 Off-site transportation of HCW

Y		N		N/A		F
F	%	F	%	F	%	
4	7	54	95	2	3	60

Y=Yes, N= No, N/A= No Answer, F= Frequency

Source: Filed work

As shown above from Table 3.11, 95% of the survey respondents responded that there is no off-transport system for hazardous wastes. Likewise all of the focused group discussants from the healthcare center also expressed that;- there is no any external party who transport the hazardous or non hazardous wastes to somewhere else.

All wastes hazardous and non hazardous are burned in the incinerator and disposed in the healthcare center compound. There are ash pits that used to dispose the burnt wastes that transported from the incinerator.

However, since there is no enough storage space and treatment facilities, it was better if there would be off-transport system to minimize the risks that poses from the unsafe waste management and unrestricted disposal place. The MOH should take in to consideration to have an off-site hazardous waste transport mechanism to minimize its negative impact on human and environmental health or standardized waste treatment plant / technology should be used.

4.12 Out sourced to third party.

It is common for healthcare institutes to outsource their healthcare waste particularly hazardous waste management for different reasons. Accordingly, survey respondents and focus group discussants of Bole healthcare center have been asked and the survey respondents expressed it as follows.

Table 4.11 Out sourced to third party

Y		N		N/A		F
F	%	F	%	F	%	
2	3	55	92	3	1	60

Y=Yes, N= NO, N/A=No Answer

Source: Field work

As shown above from table 3.12, 92% of the survey respondents stated that there is no any third party to treat or dispose hazardous and non hazardous wastes of the healthcare center. The focused group discussant also confirmed that there is neither outsourced transportation nor waste treatment. The healthcare center takes all the responsibilities to segregate, collect and dispose all hazardous and non hazardous wastes using the available resources and skill of the healthcare center staffs.

All of the focus group discussant also suggested that it is preferable to have some third party to take care of the hazardous wastes because it is impossible to manage hazardous waste using the existed resources and man skill. As a result, currently wastes particularly hazardous wastes are not managed properly and might result in different negative impact on human health and the environment.

As can be understood from all the respondents, there is no any out sourcing of waste transport and waste treatment nor proper facilities to treat and transport wastes. This shows that the probability of hazardous waste spread on the environment and being danger to the environment is high and the concerned Government Agencies have something left to be done on this issue.

4.13 Where do treated wastes finally disposed

The in-depth interview respondents from the healthcare said that, after all wastes are burned in the incinerator, ash and sharps are transported to the available open ditch. Ash is transported using wheelbarrows or carts but since the wheelbarrows and carts do not have any cover, the ash blew up on our face during transportation particularly during the windy time and we faced different health problems.

Table 4.12 Where do treated wastes finally disposed

Item	F	%	Total Frequency
Ash Pit	39	65	39
Incinerator	11	18	11
Out sourced			
N/A	10	16	10
Total Frequency	60	100	60

F=Frequency, N/A= No Answer

Source: *Filed Work*

As shown from Table 3.12 above 16%, of the survey respondents do not know where waste are finally disposed. Whereas 65% of the respondents know that waste is finally disposed in the ash kit and the remaining number of respondents (18%) also aware that wastes are finally disposed in the incinerator.

Besides, the focused group discussants also added that there is no enough and secure space for disposal of treated wastes. Ash pits are dugout in different places at different times and are not permanent and are not safe because they don't have lid and are not access restricted. Ash may blow up by wind on the environment and pollutes the environment. The final disposal places are open sites (ditches).

Healthcare institutes need to have enough and well secured and restricted waste disposal place as we can see from different literatures. These 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).

4.14 Risks of healthcare waste on the Environment

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)

Unsafe healthcare waste management particularly hazardous wastes resulted in unexpected human and environmental risks.

All the research participants have been asked whether the following items are risk to the environment.

Thus, as shown in the table below 47% of the survey respondents believed if hazardous healthcares are not managed properly, they could be resulted in respiratory problems which is sever inhalation problems that is incineration risk whereas.40% of the survey respondents agreed that unmanaged healthcare wastes may bring unmanaged dumpsites which affects the environment and human health because of the rodents and flies that could be produced in this unmanaged dumpsites.

Table 4.13 Risks of healthcare waste on the Environment

Item	F	%	Total Frequency
Sewerage of untreated liquid	14	23	14
Present of unmanaged dumpsite	24	40	24
Incineration Risk	28	47	28
Others(bad odor,	6	10	6
N/A			
Total	60		60

Source: Field work

Not only that, while some of the survey respondents (23%) assumed, unmanaged hazardous wastes particularly hazardous liquid waste could be a risk of the sewerage systems, the remaining 10% of the survey respondents said bad odor is also the other problem or risk.

Besides, the participants of the focus group discussion also confirmed that unmanaged and un treated healthcare wastes particularly hazardous liquid and solid wastes could be resulted in serious environmental risk, inhalation problem from the incineration, untreated liquid waste joined directly to the municipal sewerage system and might contaminate the non hazardous waste water, creates bad odor and affects human health.

The key informants from Environmental Protection Agency (EPA) also worried about the significant impact of healthcare wastes on the environment and said *“Though, we are aware that hazardous healthcare wastes are very danger to the environment and to human health even needs special care than other wastes, there is a gap until the moment that we do not play any role in controlling, auditing and certification of healthcare institutes about their waste management methods and their environmental protection for some reasons. We do not have any autonomy still the moment but hope this will be solved in near future by working in collaboration with the MOH”*.

As it is stated in the literature, liquid waste should be treated using different treatment plants and chemicals. Waste water should not mix to the municipal sewerage system before it is treated otherwise it could contaminate the municipals waste water and pose risk to the environment and human health. If liquid waste is treated using treatment plant, it can be reuse for different purposes like washing clothes, for plant and others as

it is stated in different literatures and the MOH and healthcare institutes should think beyond safe disposal.

4.15 Assessments of treatment methods and accreditation 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)

With this regard, the focus group discussants from the healthcare institute have been asked whether they have been assessed by the Environmental Protection Agency of Ethiopia about their hazardous waste management methods and accreditation system if any. They said “

With regard to hazardous health care wastes, there is no any interaction between MOH or healthcare centers and the Environmental protection Agency of Ethiopia. Thus, the EPA of Ethiopia do not have any input in environmental protection particularly concerning healthcare hazardous waste and their direct impact on the environment. There is no any accreditation system and in general it can be said we do not have any communication or common issue till the moment”.

The three key informants from the EPA also put this idea; “*we do not have any auditing mechanism or certification mechanism till now. Until the beginning of 2014 all hazardous and non hazardous wastes were treated like other municipal wastes”.*

“ There is a no clearly stipulated rule that apply to all persons who generate, collect, receive, store, transport, treat and dispose of healthcare wastes in any form. Besides, the EPA does not have adequate power to control pollution that arises from healthcare institutes until the moment”.

“Thus, critical work is required to be done to minimize the environmental pollution aroused from healthcare wastes. However, identifying the problems, the first draft on hazardous waste management and controlling guide line is developed and is expected to be enacted before the end of 2014”.

A key informant from the MOH of also said “*there is no any controlling mechanism or developed check lists by the ministry of health to audit the proper implementation of hazardous waste management that could arose from healthcare institutes and we are not*

also working in collaboration with the EPA. But currently, check lists are already developed by the MOH and we are looking for the approval by the concerned bodies” (key informant from MOH).

“Thus, it is now on process and is believed to be enacted in the near future. But with regard to the relation between our minister office and the EPA, there is no any interaction or common issue between MOH and EPA in regarding to waste management and its pollution impact on the environment until now”.

The focused group discussants from the healthcare center also added that they do not know even clearly what the role of EPA is and the relationship between the healthcare’s hazardous waste management and the EPA.

They said *“Let alone certification no single official from EPA has ever visited our healthcare institute and waste management method. In general we do not have any relation with EPA in regard to the waste management”.*

Thus, the EPA and MOH 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.

Table 4.14 Assessments of treatment methods and accreditation by EPA

Y		N		N/A		F
F	%	F	%	F	%	
6	10	44	73	10	17	60

Y=Yes, N=NO, N/A= No Answer, F= Frequency

Source: *Field work*

On the other hand, as shown from Table 3.15 above 73% of the survey respondents responded that they do not have any awareness about EPA certification or integration with the healthcare’s waste management while 10% said we expect there might be certification by the EPA and 17% of the survey respondents said nothing about the recognition and certification of healthcare centers by EPA.

This shows that where as healthcare wastes are hazardous and needs special care, the Environmental Protection Agency of Ethiopia did not take its responsibility in controlling and certification of waste management method of healthcare institutes. The EPA and MOH do not have any interaction with this regard. However, as can be seen

from experience of Canada and different developed countries and WHO, both these agencies should work in harmony and cooperatively for the success of hazardous waste management

4.16 Availability of PPE

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)

The janitors are the most risk exposed part of the healthcare center because their work nature has direct relationship. Thus, personal protective equipment (PPE) is mandatory to protect them from unexpected injuries and infections.

To this question seven of the in-depth interview respondents (Janitors) stated *“We have only heavy duty gloves to protect from all kind of wastes even liquid hazardous and solid hazardous wastes. We do not have plastic apron for liquid waste rather we wear guans, we do not have eye protective glass, we do not have safety shoes, we do not have masks. As a result, we have faced different problems like blood and blood contaminated liquid waste sprinkled to our mouth and eyes, we faced different injuries from used sharps like needles, we are suffering from continuous respiratory diseases like common cold, sinus, TB and bad odors from the over flow of toilets and over flow of old placenta”*.

One of the janitors said *“Begzabher meheret new Yeminenorew”* which means *“we are living by the mercy of God not by the presence of PPE. Because of the unavailability of sufficient and standardized PPE, we are jeopardized with different health problems”*.

The other janitor also said *“despite of our miserable life, it is a dream for us to lead comfortable life including our parents. Though, we have claimed so many times, no one did give us ear , we do not have any option rather than looking for our death day”*.

While majority of the focused group discussants from the healthcare center also confirmed that the mentioned problems are true, the representative medical director tried to resist and said there are of course some problems, but not that much exaggerated. We have available masks for example, but none of the sanitarians have requested for it before.

PPE is mandatory for healthcare staffs particularly those who have direct relation with hazardous waste like janitor's gyny workers and operation theater staff members. As it is clearly stated by the janitors and other staff members, they are exposing to different health problems because of the inaccessibility of personal protective materials which is contradictory to WHO and other literatures. The MOH and particularly the bole 17 healthcare center have to take this assignment seriously and should provide the required PPE. Since it is human life related issue, it should not be taken as optional rather it is mandatory to have the right PPE.

4.17 Waste water management

Poor management of waste water and sewage sludge could result in the contamination of water and the environment with pathogens or toxic chemicals. Healthcare sewage contains 2 to 10 times more antibiotic resistant bacteria than domestic waste water. (<http://www.healthcarewaste.org>, 2010)

The researcher tried to find if there is any recorded data how much water is consumed per day and what fraction or portion of this water is waste; however there is no any recorded data and may need further study.

Since waste water is one of the liquid contaminated wastes, it requires special handling. Waste water might pose an infectious risk to healthcare workers who handle those wastes and also pollutes the environment and might affect health of other society

The focused group discussants from the healthcare center said *“there is no flushable toilet to avoid splashing, there is no septic tank in the healthcare center and there is no any treatment or purification mechanism before liquid waste is disposed. Either hazardous or non hazardous waste water is directly streamed in to the municipal sewerage system from their sources before they are purified or treated. There is no any segregation between waste water and other hazardous liquid waste like liquid waste from the laboratory, radiology, minor operation and other sections. All the liquid waste are mixed and streamed down to the municipal sewerage system. If there would be water treatment plant, water could be recycled and reused but we do not think this could be happened in the near future”*.

On the other hand, the in-depth interview respondent from the healthcare center (janitors) said *“we do not have any plastic apron while we are disposing liquid waste, not only that sometimes we faced different problems from the sprinkled of blood and other contaminated liquid waste because we do not have protective eye wear (Goggle) and utility gloves. And they also confirmed that there is no any segregation between waste water and other liquid wastes, there is no any treatment or purification method. There is no septic tank in the healthcare compound that uses to accumulate waste water before treatment and disposal is done”*.

Thus, the existing healthcare’s liquid waste management is not safe and secured. There should be septic tank and Water treatment plant is required to treat waste water before disposing it to the municipal sewerage system. In general to have safe liquid waste management, it needs further work”.

4.18 Budget

Healthcare waste management needs its own budget because it incurs cost from the time of segregation to the point of disposal. Formulation of budget could be based on cost of land, cost of infrastructure like incinerator and store room, vehicles, bag stands or containers, PPE, operating and other costs. (<http://www.healthcare waste.org>)

The focused group discussant from the healthcare center (management body) stated that there is no allotted budget specifically for healthcare waste management not only that due to the shortage of budget, no sanitarian is assigned for the healthcare center. Of course it would be very vital if there would be allotted budget for the proper management of healthcare waste.

A key informant from the MOH also confirmed that no specific budget is allotted for healthcare wastes. This is one of the significant gaps that we have. However, there is a plan to have such budget and hopefully it will be worked out in the near future. It is planned to work with some interested stakeholders like WHO and other not for profit organizations.

As can be seen from literatures, developed countries like Canada, has allotted 5% of their total budget for waste management.

From this it can be understood that though budget is required for healthcare waste management, there is no allotted budget for this case and as a result there are some gaps

while managing healthcare wastes. The Ethiopian Government particularly the MOH should take major action and put in to ground what is planned in collaboration with other stake holders as said by the key informant from MOH.

4.19 Do the existing practice of waste handling, storage and disposal system safe

All the respondents have been asked to put yes or no whether the existing practice of waste particularly hazardous waste management is safe.

Table 4.15. Do the existing practice of waste handling, storage and disposal system safe

Y		N		N/A		Total Frequency
F	%	F	%	F	%	
11	18	47	78	2	3	60

Y=Yes, N= No, N/A= No Answer, F= Frequency

Source: Field work

A shown from Table 3.19 above, 78% of the survey respondents do not believe that the existing waste management system is safe. Besides, most of the focus group discussants from the healthcare center confirmed that the existing waste management practice is not safe and policy and system reform is required.

Likewise they said, “since healthcare waste are hazardous by their very nature, all the required human and material resources should be available for example sanitarian should be assigned since sanitarian is the owner of waste management, budget should be allotted because waste management requires its own budget, other resources like PPE should be available to save the life of the sanitarians and other risk exposed staffs”.

Thus, as can be seen from the data collected from the survey respondents and the focus group discussants, the existing waste management system is not free of risk. Since healthcare issues are issues of human life, the Government and concerned stakeholders should give special attention and many things are expected to be done at least to minimize the risk that might come from the unsafe hazardous waste management that are released from healthcare centers.

4.20. General Comments related to HCWM

Respondents have been asked to put their comments and opinion in relation to healthcare waste management of the existing system and its pollution impact.

After critical reading of all the comments and opinions of the respondents, the researcher tried to compile all their comments and opinions in brief as follows:-

It is true that the existing system lacks many things to be safe and have safe waste management system. People living around the healthcare center are complaining about the health risks that might pose due to the emission of smoke that comes out from the incinerator, bad odor from the toilets and placenta pits and ash pits.

The placenta pit is not standardized and as a result placentas are overflow to the surface of the earth during rainy times and different birds like eagles take away and dropped them in different places which might affect the environment and health of the society even those who are living further from the health center. The placenta pit has lid but it is not access restricted and do not have fence. On the other hand, the ash ditch does not have any lid and ash blow over to the environment and affects peoples' health.

The health package prepared by the MOH itself focused mainly on prevention from infection but waste management should be also taken as the first step of infection prevention. Education should be given to the beneficiaries and healthcare staffs about HCWM like other health educations such as education about HIV, TB, Hepatitis, family planning and other diseases. Of course this issue should not be let only to healthcare centers, but also other stake holders 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.

Solid and liquid wastes and hazardous and non hazardous wastes should be segregated from their source. Wastes that should be incinerated should be incinerated without mixing other non incinerated wastes.

PPE is one of the preventive methods, thus, PPE should be available in the healthcare center without any condition. It should not be optional to have PPE for the janitors and other risk exposed staff members.

Budget should be allotted for the management of healthcare waste particularly for proper management of hazardous waste. On the other hand, hazardous waste management could be transferred to external party to minimize health and environmental risk and for better management. Not only that, the healthcare institute does not have enough disposal space and externalized of waste disposal and treatment seems mandatory.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Health care units produce large amount of waste in the process of providing services to mankind. The spontaneous growth of population and private and public healthcare institutes within the last decade, led to the production of huge amount of hazardous and non hazardous wastes.

Healthcare Waste Management is one of the important obligatory functions of not only healthcare center local bodies but also of the EPA and other interested stakeholders like NGOs. However, currently this essential service is not efficiently and properly performed by the concerned bodies and is resulted in various, social and environmental problems. Healthcare Waste management problem is complex because it involves a multitude of scientific, technical, economic and social factors. Similarly, it is observed that lack of resources, institutional weakness, absence of proper technology, transportation systems and disposal options, social problem associated with lack of awareness towards HCWM and environmental cleanliness and lack of sanitarian have made this service unsatisfactory and inefficient in the study area.

Less or no effort is made by environmental regulatory agencies and waste generators to a better management of the wastes produced from healthcare centers. 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, financial and social challenges faced by Bole 17 health care units in managing their wastes properly and ensuring health and environmental safety. This may be also useful for resolving problems with the said waste management process in Ethiopia and provide basis for recommendations to the government, healthcare authorities, private healthcare industries and those interested in improving their existing health care waste management strategies and standards.

The overall findings of this study depicts that the healthcare institute is not applying proper waste management, has technical, financial, 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 HCC. The final waste disposal areas are not access restricted and some of them even do not have lid or have unfitted cover 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 center 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 particularly in developing countries like Ethiopia same is true for Bole 17 HCC. However, the existing incinerator is not standardized. Though, there are different types of portable and non portable incinerators that could be made from metal sheets, bricks and other materials, the existing incinerator in this healthcare center is made of bricks, is not water proof, has no cover, is located at less than 5 meters from the toilet and reception.

Thus, the HCWM method of this healthcare institute in particular and the MOH and EPA in general need to make policy reformation and much assignment is left to be done to minimize the significant gaps seen in managing HCW and its pollution impact.

5.2 Recommendations

During the conduct of this research, it was observed that the existing management of HCW practice in Ethiopia and Addis Ababa particularly Bole 17 healthcare institute is poor and faced different challenges. Thus, further work and remedial action from the MOH, EPA and management of each healthcare is expected to be implemented on this issue.

This 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 and in Ethiopia as well.

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

Based on the research findings, the researcher tried to put his recommendations with regard to the existed WM practice and taking practice of developed countries into consideration.

- Regular training on healthcare waste management should be given by the MOF and EPA to staffs and beneficiaries to improve the current practices.
- Regular supportive supervision and training of healthcare staff and beneficiaries of HCCs by senior administrators should be done to ensure compliance of safe healthcare waste management.
- Proper Segregation of waste should be adopted at point of generation by the HCC by providing the required resources and creating awareness.
- Healthcare centers 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.

- Rules, conventions and principles should be properly enacted. Example “polluter pays” principle, as stated by the WHO, and available in the healthcare waste management guide line, 2008, Ethiopia.
- The waste management should have to have responsible person like sanitarians unlike the existing practice, and the MOH and Addis Ababa health bureau should take this responsibility.
- Establishment of a monitoring frame work to review and audit HCWM plans should be implemented at all levels.
- There should be certification system of healthcare institutes by the concerned Government agency like EPA.
- Budget should be allotted for the waste management cases. Some developed countries like Canada allot 5% to 10% of their budget for waste management.
- Healthcare institutes need to have standardized incinerator to minimize the risk that pose from the emission of gaseous waste during incineration.
- As we can see from the experience of different countries like India, many people are generating their income from wastes by recycling and other mechanisms. Thus, the Ethiopian Government, Potential citizens and other stakeholders should exert effort to do something on this regard. Wastes should not always be thought something useless; a lot of things can be done from wastes by recycling and reusing them like energy creation.

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Appendices

Appendix 1: Survey Respondents from the Healthcare Center

Addis Ababa University

School of Graduate Studies

Faculty of Business and Economics

Department Of Public Administration and Development Management

Survey questionnaire for healthcare waste management

This research is only for the accomplishment of master's degree in public administration and development management. The research deals with healthcare waste management and pollution impact on the environment. The researcher understands all confidential issues if any.

Thank you

Mengistu Zelalem

1. Demographic back ground of participants

1.1 Sex-----1.2 Age-----1.3 Education-----

2. Healthcare information

2.1 Healthcare institution's (name, location):--- -----, Location-----

2.2 No of Patients per day: -----, inpatients/day: -----, outpatients/day: -----

2.3 No of Wards -----

Questionnaires

Dear respondent, circle/write /the answer of your choice. It is possible to choose more than one answer.

1. Waste segregation, collection, storage, and handling

1.2 Indicate by X the type of waste (if any) that is segregated from general waste stream.

Description	Yes	No
Infectious waste		
Chemical waste		
Pharmaceutical waste		
Sharps		
Radio-active waste		
Bio degradable Waste		
Plastic/ polythene		
Paper		

1.2 What type of labeling, colour-coding (if any) is used for marking segregated waste?

Describe-----

1.3 Where is the segregated waste stored while awaiting removal from the healthcare or disposal? Describe. -----

2. Challenges

2.1 What are the major challenges in managing healthcare wastes and implementing the Healthcare waste management guide lines or principles (if any)?

☐ Lack of Segregation Practices

☐ Lack of Proper Operational Strategy

☐ Poor Regulatory Measures

☐ Lack of Top Management Commitment

☐ Lack of Adequate Facilities

☐ Financial Constraints

☐ Inadequate Awareness and Training Programs

☐ Inadequate Pressure from Societies

3. Awareness

3.1 Is there any awareness creation program for both your healthcare center users and staff members of healthcare waste management? ☐ Yes ☐ No ☐ NA

3.2 Are instructions/training given to newly hire waste management staff(if any)? ☐ Yes ☐ No ☐ No answer

4. Waste Management Committee

4. Green team is Healthcare waste management committee that is organized from different departments of the healthcare center who have different skills, professions and experience for protecting the environment from the pollution impact of healthcare wastes.

4.1 Does your healthcare center have green team (Waste Management Team)?

☐ Yes

☐ No

☐ No answer

5. Are there clearly defined procedures for collection and handling of wastes from specified units in the Healthcare center? ☐ Yes ☐ No ☐ No Answer

5. Waste Transportation

5.1 Is there off-site transportation of HCW involved prior to disposal? If yes, please provide details of the following:

5.1.1 Who does the transportation? -----

5.1.2 How often is waste removed? -----

5.1.3 What are the control methods practiced? -----

6. Waste Treatment

6. 1 How is HCW treated prior to disposal? -----

6.2 Is there a waste treatment facility available within the healthcare Institution?

(Incinerator/steam sterilizer) -----OR

6.3 Has the healthcare center outsourced HCW treatment to third party? ☐ Yes ☐ No

☐ No answer If so, does the organization offer satisfactory services? ☐ Yes ☐ No

☐ No answer

6.4 Where is the treated waste finally disposed to? -----

7. Waste water generation, treatment and disposal

7.1 What is the quantity of

(i) Waste water generated per day -----

(ii) Water usage per day -----

7.2 Methodology of waste water treatment and disposal

.....

8. Risks of healthcare waste on the Environment

8.1 What are the risks of Healthcare wastes on the Environment

☐ discharge of raw sewage ☐ uncontrolled dumping

☐ incineration risks ☐ others-----

9. Do you think the current practices of waste handling, storage and disposal offer sufficient security and protection against risks posed by hazardous HCW? -----

10. Issues / comments related to Healthcare Waste Management in your institution

Appendix 2 : Key Informants from the EPA
Addis Ababa University
School of Graduate Studies
Faculty of Business and Economics
Department Of Public Administration and Development Management

This research is only for the accomplishment of master's degree in public administration and development management. The research deals with healthcare waste management and pollution impact on the environment. The researcher understands all confidential issues if any.

Thank you

Mengistu Zelalem

1. What is your auditing mechanism of healthcare waste management?

2. What is your segregation mechanism those well performing from the non performing of waste management.-----

3. Do you have any certification mechanism? -----

4. Do you have clearly stated policy on how to control healthcare waste and majors that should be taken if violated? -----

Appendix 3: Respondents from the nearby residents

School of Graduate Studies

Faculty of Business and Economics

Department Of Public Administration and Development Management

This research is only for the accomplishment of master's degree in public administration and development management. The research deals with healthcare waste management and pollution impact on the environment. The researcher understands all confidential issues if any.

Thank you

Mengistu Zelalem

1. Have ever faced any health problem as a result of unsafe waste management of the healthcare center? Explain -----

2. Have you ever raised your complains about the unsafe waste management problem to the concerned body? -----

3. What was the response and what actions have taken to resolve or minimize the problem? -----

Appendix 4: Key Informant from the MOH
Addis Ababa University
School of Graduate Studies
Faculty of Business and Economics
Department Of Public Administration and Development Management

This research is only for the accomplishment of master's degree in public administration and development management. The research deals with healthcare waste management and pollution impact on the environment. The researcher understands all confidential issues if any.

Thank you

Mengistu Zelalem

1. Do you have specified Budget for waste Management? -----

2. What is your checking and controlling mechanism that healthcare centers are managing their wastes safely?
3. Do you have any interaction with the EPA with regard to the healthcare waste management in relation with the Environmental Protection issues?-----

DECLARATION

I declare that **“HealthCare waste Management and its pollution impact on the Environment in the case of Bole 17 healthcare institute ”** 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 Mengistu Zelalem

Signature _____

Date _____

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

Name CD – Dash (Professor)

Signature _____

Date _____