

**YANGON UNIVERSITY OF ECONOMICS
MASTER OF PUBLIC ADMINISTRATION PROGRAMME**

**A STUDY ON MEDICAL WASTE MANAGEMENT SYSTEM AND
PRACTICES AMONG THE HEALTH CARE PERSONNEL OF
NO. (2) MILITARY HOSPITAL IN YANGON**

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EMPA - 36 (15th BATCH)**

AUGUST, 2019

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A thesis submitted in partial fulfilment of the requirements for the
Master of Public Administration (MPA) Degree

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MASTER OF PUBLIC ADMINISTRATION PROGRAMME

This is to certify that this thesis entitled “**A Study on Medical Waste Management System and Practices among the Health Care Personnel of No. (2) Military Hospital in Yangon**”, submitted as a partial fulfilment towards the requirements for the degree of Master of Public Administration, has been accepted by the Board of Examiners.

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ABSTRACT

The management of medical wastes is the issues of growing concern since these wastes are major sources of contamination and pollution. The importance of tracking and disposal of infections wastes in hospital is concerned not only with the medical personnel but also with hospital administrators. The medical wastes generated from hospitals can be hazardous, toxic and even lethal because they have great potential for transmission of the diseases and injury that can also result in environmental degradation. The study objectives are to identify the level of awareness regarding medical waste management system and to analyses the practices of medical waste management in a government hospital. The survey is conducted on the No. (2) Military Hospital (500 Bedded) at Dagon Township, Yangon Region. The question of knowledge on types of medical waste, 96% of total respondents answered that used hypodermic needles, syringes, intravenous sets, blood sets are medical waste. Moreover, they asked used dressing, bandages and sticking plaster, gloves and masks are medical waste are medical waste things. , the current status of health care providers on medical waste management in this study will help the hospital authorities to develop the standard operation procedures and guidelines for improving this situation in future, including plans for better training programed and monitoring of medical waste management system in the study hospital

ACKNOWLEDGEMENTS

First of all, I would like to express my sincere gratitude to Professor Dr. Tin Win, Rector of Yangon University of Economics, Professor Dr. Ni Lar Myint Htoo, Pro-Rector of Yangon University of Economics, Professor Dr. Kyaw Min Htun, Pro-Rector (Retired), University of Economics, Professor Dr. Phyu Phyu Ei, Programme Director of Master of Public Administration and Head of Department of Applied Economics for and guidance during my studies.

I am sincerely and heartily grateful to my supervisor, Professor Dr. Tin Hla Kyi, Programme Director and Head of Department (Retired), Department of Applied Economics, Yangon University of Economics, for the support and guidance given to me throughout my thesis writing.

I gave my heartfelt thanks to all the respondents of the field survey who gave invaluable input. They are highly appreciated for their willingness and patience in providing answers to all of the questions of the questionnaire. I would also like to extend my appreciation to all those who contributed in various ways to my thesis. Finally, it is my great pleasure to thank all of my friends who helped me throughout my difficult time during my thesis.

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LIST OF ABBREVIATIONS

AIDS	- Acquire Immune Deficiency Syndrome
CBD	- Central Business District
DSGH	- Defense Services General Hospital
DSLH	- Defense Services Liver Hospital
DSOGCH	- Defenses Services Obstetrics, Gynecology and Children Hospital
DSOH	- Defense Services Orthopedic Hospital
HBV	- Hepatitis B Virus
HCV	- Hepatitis C Virus
HIV	- Human Immunodeficiency Virus
MCDC	- Mandalay City Development Committee
MSWM	- Medical Solid Waste Management
OPD	- Out Patient Department
PCD	- Pollution Control Department
SOP	- Standard Operation Procedures
WHO	- World Health Organization
WMPS	- Waste Management's Practices
WWTP	- Wastewater Treatment Plants
YCDC	- Yangon City Development Committee
YGH	- Yangon General Hospital

CHAPTER I

INTRODUCTION

1.1 Rationale of the Study

The management of medical waste is an emerging worldwide concern. There is not only increase use of chemicals and drugs, but also increase use of disposable items and consequently, large amounts of medical waste are being generated on a daily basis. As medical wastes contains highly toxic chemicals and pathogens. In most developing countries there is growing concern that the enormous amount of hazardous medical waste generated, not only results in a huge disposal costs, but also creates the potential for the spread of diseases. Cause of medical waste management in developing countries include a lack of appropriate legislation, effective control, financial constraints, lack of education, training and awareness and other related social problems. Indiscriminate disposal of medical waste and exposure to such waste poses a serious threat to the environment and to human health. Medical waste requires specific treatment and management prior to its final disposal. The severity of the threat is further compounded by the high prevalence of disease such as human immunodeficiency viruses (HIV) and Hepatitis B and C.

Hospital-acquired infections have been estimated at 10 % of all fatal/life-threatening diseases in the South-East Asia region and have been identified as one of the indicators for the management of waste. The absence of proper waste management, lack of knowledge about health problems from medical waste, insufficient financial and human resources and proper control of waste disposal are the most critical problems connected with medical waste. Although there is increased global knowledge among health care personnel about health problems there is a still needed appropriate management technique.

Biomedical waste management has recently emerged as an issue of major concern not only to hospitals, primary health care centers and nursing home authorities but also to the environment. Advances in medical facilities and the introduction of more sophisticated instruments have increased the waste generation per patient in health care units worldwide. (Hakim, Mohsen and Bark, 2013)

Medical waste contains potentially harmful microorganisms which can infect hospital patients, health-care workers and the general public. Other potential infections risks may include the spread of drug-resistant microorganisms from healthcare establishments in to the environment. In a working environment that have unsafe medical waste management practice may result an exposure to infectious waste by healthcare workers, patient, clients that could in turn create infection due to blood borne pathogens.

Waste and by-products can also cause injuries, for example: radiation burns, sharps-inflicted injuries, poisoning and pollution through the release of pharmaceutical products, in particular, antibiotics and cytotoxic drugs, poisoning and pollution through waste water and poisoning and pollution by toxic elements or compounds, such as mercury or dioxins that are released during incineration (WHO, 2011).

The waste produced in the course of healthcare activities carries a higher potential for infection and injury than any other type of waste. Inadequate and inappropriate knowledge of handling of medical waste may have serious health consequences and a significant impact on the environment as well. However, lack of awareness has led to the hospitals becoming a hub of spreading disease rather than working toward eradicating them (Chudasama, Rangoonwala, Sheth, Misra, Kadri and Patel, 2013).

The management of medical wastes is the issues of growing concern since these wastes are major sources of contamination and pollution. Proper management of medical waste must be known by all health care staffs because they are high risk group who are almost always contact with these wastes. The importance of tracking and disposal of infections wastes in hospital is concerned not only with the medical personnel but also with hospital administrators. Medical waste is a special category of waste which needs special precautions while handling. The medical wastes generated from hospitals can be hazardous, toxic and even lethal because they have great

potential for transmission of the diseases and injury that can also result in environmental degradation. An adequate and appropriate knowledge of medical waste management among the health care personnel is the first step towards developing favorable attitude and practice thereby ensuring safe disposal of hazardous medical waste.

Medical waste management is still a major problem mostly in developing countries. Myanmar like many developing countries experience the problem of getting sufficient medical supply and even worse is the disposal of medical waste. A proper knowledge among the health care providers about the rules and regulations of medical waste and a sound understanding of their roles and responsibilities in handling medical waste can go a long way towards the safe disposal of hazardous medical waste and protect the community from various side effects of the hazardous waste. Observation of the attitude and current practice of nurse and health care personnel concerning medical waste management play a role to assess the need for waste management training for them in a tertiary teaching hospital. Proper training of medical waste manage among the health care workers can have a pivotal role in dissemination of information to others. Nurses and other health care personnel must also be educated on the risks in order to improve their practices with regard to medical waste management. Since today's nurses and doctors are required to carry out expanded roles in a variety of settings. With this background this study was undertaken in view of assessing the existing knowledge, attitude and practice of the health care personnel in a tertiary care hospital regarding the medical waste management. The thesis is focused on assessment of knowledge, attitude and practice of medical waste management among health care providers at No. (2) Military Hospital (500.beded). It is hoped that this study will make relevant recommendations to hospitals and medical centers on possible ways of determining managing medical waste.

1.2 Objectives of the Study

The objectives of the study are to identify the level of awareness regarding medical waste management system and to analyses the practices of medical waste management in a government hospital.

1.3 Method of Study

Descriptive method is used based on primary data and secondary data. Data collected method using quantitative and qualitative method. The primary data was collected with structured questionnaire (90), in-depth interview (20) and key informal interview at No. (2) Military Hospital (500-bedded) in Dagon Township, Yangon Region. The survey period is within September, 2018 to July, 2019. The secondary data was obtained from the government official reports and records of the Ministry of Health and Sports and through internet, libraries, publication and review of record, return and report from the surveyed hospital.

1.4 Scope and Limitations of the Study

This thesis focuses only on the medical waste management and examined the level of medical waste management in health care service of No. 2 Military Hospital (500-bedded) Dagon Township. This research did not include senior medical persons of management role.

1.5 Organization of the Study

The thesis is composed of five chapters. Chapter 1 is concerned with the introduction. In the introduction, the rationale of the study, objective of the study, method of study, scope and limitation of the study and organization of the study are mentioned. Chapter 2 deals with literature review. The literature review presents literature on medical waste, classification of medical waste, importance of medical waste in hospitals, the medical waste management program, reused medical waste a problem in developing nations and review on previous studies. Chapter 3 presents the medical waste management in Myanmar. The medical waste management in Myanmar is concerned with medical waste management, environmental institutional, policies and legislative framework. In chapter 4, survey analysis is with the survey profile, survey design and survey findings. Finally, Chapter 5 consists of findings and recommendations.

CHAPTER II

LITERATURE REVIEW

2.1 Medical Waste

A hospital produces many types of waste material. Housekeeping activity generates considerable amount of trash, and the visitors and others bring with them food and other materials which must in some may be disposed of waste. In addition to the waste that is produced in all residential buildings, hospitals generate pathological waste, blood soaked dressings, carcasses and similar waste. These waste materials must be suitably disposed of immediately lest they purity, emit foul smells, act as a source of infection and disease, and become a public health hazard. In developing countries, many of the public health problems are also related to defective sewage and waste disposal. (Sakharkar, 2009)

Medical waste includes all the waste generated by health-care establishments, research facilities, and laboratories. In addition, it includes the waste originating from 'minor' or 'scattered' sources such as that produced in the course of health care undertaken in the home (dialysis, insulin injections, etc.). Between 75% and 90% of the waste produced by health-care providers is non-risk or 'general' medical waste, comparable to domestic waste. It comes mostly from the administrative and housekeeping junctions of health care establishment and may also include waste generated during maintenance of health care premises. The remaining 10 to 25% of medical waste is regarded as hazardous and may create a variety of health risks. (WHO, 2009)

2.2 Classification of Medical Waste

Medical wastes are categorized according to their weight, density and constituents. The World Health Organization (WHO) has classified medical waste into different categories.

(a) Infections waste

Infections waste contains pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. This category includes cultures and stock of infectious agents from laboratory work, waste from surgery and autopsies on patients with infectious diseases, waste from infected patients in solution wards, waste that has been in contact with infected patients undergoing hemodialysis (e.g. dialysis equipment such as tubing and filters, disposable towels, gowns and aprons, gloves and laboratory coats) and waste that has been in contact with animals inoculated with an infectious agent or suffering from an infectious disease (WHO, 2009).

(b) Pathological Wastes

Pathological wastes consist of tissues, organs, body parts, human fetuses and animal carcasses, most blood and body fluids. Within this category, recognizable human or animal body parts are also called anatomical waste. Anatomical waste is also considered as an infectious waste, even though it may also include healthy body parts (WHO 2009).

(c) Sharp Wastes

Sharp wastes are items that could cause cuts or puncture wounds, including needles, syringes, scalpels, saves, blades, broken glass and nails. Whether or not they are infected, such items are usually considered as highly hazardous healthcare waste. (WHO, 2009)

(d) Pharmaceutical Wastes

Pharmaceutical wastes include pharmaceutical products, drugs, and chemicals that have been returned from wards, have been spilled, are outdated or contaminated, or are to be discarded because they are no longer required. These also include discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials (WHO, 2009).

(e) Genotoxic Waste

Genotoxic waste is highly hazardous and may have mutagenic, teratogenic, or carcinogenic properties. It raises serious safety problems, both inside hospitals and after disposal, and should be given special attention. Genotoxic waste may include certain cytostatic drugs, vomit, urine, or faces from patients treated with cytostatic drugs, chemicals, and radioactive material. Cytotoxic (or antineoplastic) drugs, the principal substances in this category, have the ability to kill or stop the growth of certain living cells and are used in chemotherapy of cancer. They play an important role in the therapy of various neoplastic conditions but are also finding wider application as immunosuppressive agents in organ transplantation and in treating various diseases with an immunological basis. Cytotoxic drugs are most often used in specialized departments such as oncology and radiotherapy units, whose main role is cancer treatment; however, their use in other hospital departments is increasing and they may also be used outside the hospital setting (WHO, 2009).

(f) Chemical Waste

Chemical waste consists of discarded solid, liquid and gaseous chemicals, for example from diagnostic and experimental work and from cleaning, housekeeping, and disinfecting procedures. Wastes with high heavy metal content fall under hazardous chemical waste, and are usually highly toxic. Mercury wastes are typically generated by spillage from broken clinical equipment but their volume is decreasing with the substitution of solid-state electronic sensing instruments (thermometers, blood-pressure gauges, etc.) Certain "reinforced wood panels" containing lead are still used in radiation proofing of X-ray and diagnostic departments. A number of drugs contain arsenic, but these are treated here as pharmaceutical waste (WHO, 2009).

(g) Pressurized Containers

Pressurized containers consist of full or empty containers with pressurized liquids gas or powdered materials, including gas containers and aerosol. Many types of gas are use in healthcare and are often stored in pressurized cylinders, cartridges, and aerosol can. Many of these, once empty or of no further use (although, they may still contain residues) are reusable, but certain types, notably aerosol cans must be disposed of (WHO, 2009).

(h) Radioactive wastes

Radioactive wastes are wastes containing radioactive substances. These include solid, liquid, and gaseous waste contained with radionuclides generated from vitro analysis body tissues and fluids, in vivo body organ imaging, tumor localization, and therapeutic procedures (WHO, 2009).

2.3 Importance of Medical Waste Management in Hospitals

Sources of medical waste include (1) Hospitals of all categories and its departments, (2) Clinics: Physicians, dentists, maternity clinics, immunization clinics, dialysis centers and dispensaries of state or central government, (3) Health care organizations: Polyclinics, nursing homes, geriatric homes, home for mentally retarded, mental asylums,(4) Support services: Blood banks, pharmacy, mortuary, central sterile supply department, laundry, technical services, laboratories and other health centers and (5) Veterinary hospitals, clinics and laboratories. (Joshi & Joshi, 2009).

The staff of various categories working in the hospitals is directly exposed to the risks of the medical wastes. The hospitals staff is responsible for generating segregating, collecting, storing, treating of the medical waste. The health care workers by virtue of their profession have to work with sharps items like needle, blades and there is risk of transmission of HIV, Hepatitis B and C viruses. The hospital is subsystem of larger social system. Therefore, medical waste has health impacts not only on health care staffs but also to the patients, their attendants and also the environment. The environmental pollution can be any form of water, air and soil pollution. (Joshi & Joshi, 2009)

All individuals exposed to hazardous medical waste are potentially at risk of being injured or infected. They include:

1. Medical staff: doctors, nurses, sanitary staff and hospital maintenance personnel,
2. In and out patients receiving treatment in health care facilities as well as their visitors;
3. Workers in support services linked to health care facilities such as laundries, waste handling and transportation services and
4. Workers in waste disposal facilities, including scavengers; (WHO, 2009)

Medical waste includes a large component of general waste and a small proportion of hazardous waste. Exposure to hazardous medical waste can result in disease or injury including one or more of the following hazards;

1. Hazards from infectious waste and sharps
2. Hazards from chemical and pharmaceutical waste
3. Hazards from genotoxic waste
4. Hazards from radioactive waste
5. Public sensitivity (WHO, 2009)

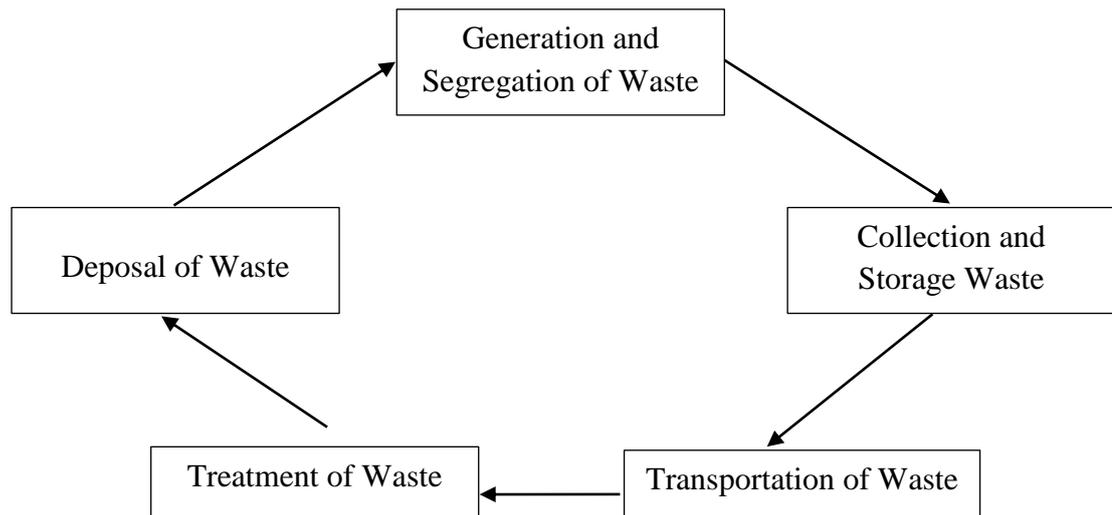
2.4 The Medical Waste Management Program

The management of the medical waste in hospital is done on the following parameters:

1. Generation and segregation of waste
2. Collection and storage of waste
3. Transportation of waste
4. Treatment of waste
5. Disposal of waste and
6. Managerial and ethical issues related with the waste management program

Figure (2.1) shows the medical waste management cycle.

Figure (2.1) Medical Waste Management Cycle



Source: Joshi, 2009

2.4.1 Waste Management Program

The concept of waste management program has been introduced to many activities, namely, industries, business and commercial, communities, houses, and hospitals. It includes waste minimization, reduce/reuse and recycle, incinerator and landfill. The adoption and promotion of this program are still very limited in the hospitals because accrediting system is not functioning due to some barriers, such as government regulations on medical waste management, lack of support from hospital administrators, and poor environmental awareness. Therefore, the commitment of hospital directors to better management is the most important criterion in promoting the waste management program to hospitals. Without support from the hospital directors, good government regulations and better environmental awareness of the staff, introduction of waste management program will be difficult.

2.4.2 Segregation, Color Coding and Storage of Waste

Waste segregation is defined as separation of different types of medical wastes by sorting; the methodology is to be designed for identification of the different types of waste, categorization of waste into different types right at the point of origin. Segregation is the essence of waste management and should be done at the source of generation of Biomedical waste e.g. all the patient care activity areas, diagnostic services areas, operation theatres, labor rooms, treatment rooms etc. The

responsibility of segregation should be with the generator of biomedical waste i.e. doctors, nurses, technicians etc. (medical and paramedical personnel) (WHO, 2009).

According to WHO recommended color-coding for hospital waste in developing countries, highly infectious waste, pathological and anatomical waste should be disposed into yellowed colored, leak proof plastic bag or container and sharp wastes must be placed into yellowed colored puncture proof containers. Chemical and pharmaceutical waste should be disposed into red colored plastic bag or containers. Radioactive waste must be disposed into lead box labeled with radioactive symbol. Remaining general waste can be disposed into black colored plastic bag or containers (Joshi, 2009).

Storage means the holding of hospital waste for such period of time, at the end of which waste is treated and disposed of. No untreated biomedical waste should be stored beyond a period of 48 hours. The containers being used to store the waste must have the essential characteristics as per WHO guidelines (Joshi, 2009).

2.4.3 Transportation of Health Care Waste

In case of transportation of the hazardous waste, due care is to be taken; neither the operator nor general public should be exposed to the risk of infectious or hazards of medical waste. The types of transportation can be either intramural or extramural. The intramural transportation, transportation within hospital, is done with the help of the push cart, waste trolleys and wheel barrow. Transportation of the wastes outside the hospital called extramural transportation and is done with the help of rickshaw, van and lorry. It is the duty of the authorized persons handling the biomedical wastes to segregate it prior to its storage, transport, treatment and disposal (Joshi, 2009).

2.4.4 Treatment and Disposal Technologies for Health Care Waste

A method, technique or process designed to change the physical, chemical or biological characteristics or composition of any medical waste so as to render such waste non-hazardous health and environment (Joshi, 2009).

Incineration used to be the method of choice for most hazardous medical waste and is still widely used. However, recently developed alternative treatment method are becoming increasingly popular. The choice of treatment system should be made carefully, on the basis of various factors, many of which depend on local conditions (Park, 2011).

(I) Incineration Process

Incineration is a high- temperature dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight. This process is usually selected to treat waste that cannot be recycled, reused, or disposed of in a landfill site. Incineration requires no pre-treatment, provided that certain waste types are not included in the matter to be incinerated. Three basic kinds of incineration technology for treating medical waste are double-chamber prolific incinerators, single-chamber furnaces with static grate and rotary kilns operating at high temperature (Park, 2011).

(A) Characteristics of waste suitable for incineration are

- (a) Low heating volume: above 2000 kcal/kg for single-chamber incinerators,
- (b) Content of combustible matter above 60%
- (c) Content of non-combustible solids below 5%
- (d) Content of non-combustible fines below 20%
- (e) Moisture content below 30%

(B) Waste types not to be incinerated include

- (a) Pressurized gas containers.
- (b) Large amounts of reactive chemical waste.
- (c) Silver salts and photographic or radiographic wastes.
- (d) Halogenated plastics such as polyvinyl chloride (PVC).
- (e) Waste with high mercury or cadmium content, such as broken thermometers, used batteries, and lead-lined wooden panels
- (e) Sealed ampoules or ampoules containing heavy metals (Park, 2011)

(C) Main advantages and disadvantages of incineration based on types of incineration technology

The followings are main advantages and disadvantages of incineration based on types of incineration technology.

- (a) Rotary kilns are adequate for all infectious waste, most chemical waste and pharmaceutical waste: however, they need high investment and high operating costs.
- (b) Prolific incineration is appropriate for all infectious waste, most pharmaceutical waste and chemical waste but this method relatively requires high investment and operating costs.
- (c) Single-chamber incineration is suitable for drastic reduction of weight and volume of waste. Other advantages are the residues may be disposed of in landfills and no need for highly trained operators. Disadvantages are significant emissions of atmospheric pollutants and need of periodic removal of slag and soot (Park, 2011).

(II) Chemical Method

In this method, the main method of waste treatment is disinfection, the process by which most of the pathogens are destroyed from any inanimate object, surface of materials. When this process is done by the chemicals, it is called chemical disinfection. Chemical disinfections used routinely in health care to kill microorganisms on medical equipment and on doors and walls, is now being extended to the treatment of health-care waste. Chemical disinfection relies on the particular properties of the chemical agent to inactive (Joshi, 2009).

(III) Wet and Dry Thermal Treatment

(A) Wet Thermal Treatment

Wet thermal or steam disinfection is based on exposure of shredded infectious waste. To high temperature, high-pressure steam, and is similar to the autoclave sterilization process. The process is inappropriate for the treatment of anatomical waste and animal carcasses, and will not efficiently treat chemical or pharmaceutical wastes (Park, 2011).

(B) Screw-feed technology

Screw-feed technology is the basis of a non-burn, dry thermal disinfection process in which waste is shredded and heated in a rotating auger. Continuously operated units also called continuous feed augers, are commercially available and already in use in several hospitals. The waste is reduced by 80% in volume and by 20-35% in weight. This process is suitable for treating infectious waste and sharps, but it should not be used to process pathological, cytotoxic, or radioactive waste (Park, 2011).

(IV) Microwave irradiation method

Most microorganisms are destroyed by the action of microwaves of a frequency of about 2450 MHz and a wavelength of 12.24cm. The water contained within the waste is rapidly heated by the microwaves and the infectious components are destroyed by heat conduction. The efficiency of microwave disinfection should be checked routinely (Park, 2011).

(V) Land Disposal

There are two types of disposal namely land-open dumps and sanitary landfills. Medical waste should not be deposited on or around open dumps. The risk of either people or animals coming into contact with infectious pathogens is obvious. Sanitary landfills are designed to have at least four advantages over open dumps: geological isolation of waste from the environment, appropriate engineering preparation before this site is ready to accept waste, staff present on site to control operations and organized deposit and daily coverage of waste (Park, 2011).

2.4.5 Management and Policy and Procedures in Waste Management

National legislation is the basis for improving medical waste disposal practices in any country. It establishes legal control and permits the national agency responsible for the disposal of medical waste, usually the Ministry of Health, to apply pressure for their implementation. The United Nations Conference on the environment and development in 1992 recommended to prevent and minimize waste production, to

reuse and recycle the waste to the extent possible, to treat waste by safe and environmentally sound methods, and to dispose of the final residue by landfill in confined and carefully designed sites.

The medical waste management has got subsystems like waste generation, waste segregation, collection, transportation and treatment of waste and finally disposal of the waste. All the subsystems are interrelated; they have to work in synergy and in perfect coordination. All staff in hospitals is to be educated in the field of waste management, they are trained, maintained and utilized. One of the important things in waste management is that the hospital administrator is expected to pay special attention to waste management teams and committees. The hospitals should prepare a biomedical waste management manual for the hospital. It would act like a reference document for all the concerned staff members. There should be standard operative procedures for all the activities related to waste management.

2.5 Problem of Reused Medical Waste in Developing Nations

Calin Georgescu, executive director of the National Care for Sustainable Development in Bucharest, Romania, issued the special investigator to the Human Rights Council and an investigator wrote in a report to the United Nations about significant challenges with the proper management and disposal of medical waste in many developing countries in the world. (Soe Hlaing, 2012).

The medical waste around the world is often mixed with general household waste and either disposed in municipal waste facilities or dumped illegally. Some 20% to 25% of the total waste generated by health care establishments is regarded as hazardous and could create health and environmental risks if not managed properly. The amount of waste generated by health care facilities in developing countries is increasing because of the expansion of health care systems and services. A lack of adequate technological and financial resources to ensure that medical waste is managed and disposed in a manner that is safe for human health and the environment is making the problem worse. While used needles, syringes, scalpels and other used objects that are sharp make up about 1% of all medical waste, contaminated used needles and other sharp items are considered the most hazardous category of medical

waste. They are reused or recycled in many developing countries without proper sterilization. (Soe Hlaing, 2012).

Needle-stick injuries and reuse of infected sharps expose health care workers and the community as a whole to blood-borne pathogens, including hepatitis B virus, hepatitis C virus human immunodeficiency virus [HIV].

Worldwide, up to 40% of injections are given with syringes and needles that are being reused without proper sterilization, the report said. It cited a World Health Organization report that said injections with contaminated syringes caused 21 million cases of Hepatitis B, 2 million cases of Hepatitis C and 260,000 cases of HIV annually. (Soe Hlaing, 2012).

Untreated medical waste reaches in a variety of ways, including through direct sales from health care facilities in developing countries. A large amount of nonhazardous materials are sold to recyclers in those areas, however, other hazardous items are often included, putting those who process the recyclables at risk. (Soe Hlaing, 2012).

Waste recyclers usually have no formal education and possess very little or no knowledge of the risk associated with the handling of hazardous substances or the precautions to adopt to minimize their adverse health effects and they usually use no proactive gear to prevent them from exposure to the hazardous substances contained in medical waste. (Soe Hlaing, 2012).

The report makes several recommendations, including raising awareness of risks medical waste poses to human health and the environment, especially those living near landfills and incineration facilities in developing countries. (Soe Hlaing, 2012).

2.6 Medical Waste Management in Thailand

Medical waste management practices (WMPs) can cause hazards and risks that affect not only the generators and operators but also the general community. An investigation of WMPs in hospitals in Thailand has shown similar and different patterns of medical WMPs consisting of infectious waste, solid waste and hazardous waste, including wastewater practices. The quantity of infectious waste generated from different size of hospitals in Chiang Mai is at a rate of 0.17 kg to 0.97 kg. Most

hospitals have an incinerator where medical waste is burned. The ash from the incinerator should be properly disposed in a landfill. Solid waste in hospitals is sent to a municipal landfill. In some hospital, there is a thriving recycling program. Some hazardous waste is either burned or sent to a private secured landfill. Others are collected in hospitals and stored for disposal. However, the assigned government agencies and a manual for helping them solve waste problems are needed. All hospitals have wastewater treatment plants (WWTP). Some WWTP need advice for coping effectively with the WWTP problems. In order to provide more effective WMPs in hospitals, a standard operating procedure (SOP) and regulations for segregation of infectious waste, solid and hazardous wastes must be developed. The SOP should outline the method for handling hospital wastes, how to collect, segregate, treat and dispose of these wastes. Furthermore, the agency responsible for regulating incinerators and WWTPs in the hospitals should regularly visit and inspect these facilities for improving their efficiency and solving problems.

According to the World Health Organization (WHO), the waste produced by health care facilities carries a higher potential for hazards and risks from infection and injury than any other kind of waste. (WHO, 1994). Medical waste or hospital waste consists of infectious, radioactive and toxic substances, as well as unsafe material from activities in clinics and laboratories in hospitals. It includes human blood and blood products wastes, tissues, animal wastes, microbiology laboratory wastes, radioactive and chemical wastes, pharmaceutical, sharp wastes in addition to general waste like paper, food and plastics. (Ministry of Public Health, 2002).

Based upon the World Health Organization (1994) report of hospital waste in America, Netherlands, and France, about 85% of the hospital wastes are actually nonhazardous waste, 10% are infectious waste and 5% are non-infectious waste but hazardous wastes. Although infectious and hazardous wastes from hospitals occur in small quantity of waste, there is a high potential of serious threat to spread out various diseases and hazardous materials from these wastes due to improper disposal of dumping and burning. The poor management of medical waste poses risks to public health and the environment, especially, in terms of the transmission of disease by viruses and microorganisms, contamination of underground water tables by untreated medical waste in landfills, as well as contamination of ambient air by uncontrolled burning.

The problem of medical waste disposal in hospitals has become an issue of increasing concern, prompting hospital administration to seek new ways of safe and cost effective management of the waste, and keeping their personnel informed of the advances in this field. In Thailand, the estimated quantity of infectious waste by Pollution Control Department (PCD) in 2000 was reported to be a total of 13,250 tons or 36.1 ton/day. (Pollution Control Department, 2000). These are generated from both government and private hospitals. Of 22 tons of infectious wastes are generated in the regional part while about 24.1 tons of these wastes are generated in Bangkok and the nearby area.

2.6.1 Waste Management Procedures

It consists of waste collection and segregation, storage, transportation, treatment and disposal. Segregation of waste is the most important step in the process of waste management. It allows management of small quantities of waste thereby reducing the risks as well as cost of handling and disposal of a large mingled waste. Segregated waste need to be stored in identifiable containers, and must separate infectious waste from hazardous waste. The general waste or solid waste and non-hazardous waste transportation should be kept separate from infectious waste and hazardous waste. The transportation containers should be properly enclosed. The driver must be trained to follow established procedures in case of traffic accidental spillage (USEPA, 1998).

2.6.2 Medical Waste Treatment Technologies

There are several medical waste treatment technologies, namely, mechanical, thermal, chemical, and irradiation processes. (Michael. LaGrega. Phillip Buckingham & Jeffrey, 2001). Mechanical process is used to change the physical form of the waste to facilitate waste handling. It consists of compaction and shredding. Compaction involves compressing the waste into containers to reduce its volume. Shredding is used to break the waste into smaller piece. This process is not considered acceptable for medical waste treatment by itself. Thermal process is designed to use heat at low temperature ($\ll 150$ °C) and high temperature (600 - 5,500 °C) to decontaminate medical waste.

The thermal processes include autoclaving, microwave treatment, and incineration. Autoclave is a steam sterilization technique that uses steam to contact with the waste directly to disinfect the waste. Microwave treatment is designed to use the electromagnetic radiation spectrum lying between the frequencies 300 and 300,000 MHz to inactivate microbial organism. Incineration processes use high temperature (800 - 1,050 °C) combustion under controlled conditions to convert wastes containing infectious and pathogenic material to inert material residues and gases. It gives a significant volume and weight reduction and it sterilize the waste. There is limitation of the incinerator due to the occurring pollution during operation. It is needed to control its temperature.

Chemical process involves the use of chemicals like chlorine compounds for disinfection. This system needs shredding step in order to provide sufficient control between the waste and disinfectants. Irradiation process is designed to use ultraviolet or ionizing radiation for irradiating and sterilizing the medical waste. Among these technologies, autoclave and incinerator methods are mostly used as a sequence for treatment and disposal of infectious waste.

In conclusion, most of the hospitals are based on standard operation procedure (SOP). But, most hospitals have similar and different patterns of medical waste management practice. A lot of hospital has an incinerator where medical waste and waste water treatment plant in our country.

2.7 Reviews on Previous Studies

Phyu Pyar Kyaw Swe (2011), it was found that their practices were also associated with age, designation, working experience and past history of receiving training. There was association between knowledge and attitude of health care providers as well as their attitude and practices. Based on the findings from both quantitative and qualitative assessment, priority of hospital waste management is lower than other services and there should be proper and intensive training programs regarding awareness and practice of waste disposal for all health-care staff including doctor, nurses and general workers with continuous monitoring at regular intervals. It is necessary to add utmost efforts on current hospital waste management system by means of adequate human resources, materials and financial support.

Soe Hlaing (2012), was found that 25.77 % of manpower was shortage in hospital service. And 31.9 % of manpower was shortage in menial workers show that waste handling process has not enough workers. The 88% of menial workers are not educated and they do not have right awareness on medical management. The survey hospital performance was increased in surgical operation service on 2011. Most of hazardous wastes such as sharp and infectious wastes were produced by operation and surgical cases.

CHAPTER III

MEDICAL WASTE MANAGEMENT IN MYANMAR

3.1 Environmental Management in Myanmar

This initial environment assessment including medical waste management provision is linked to activities for the proposed Essential Health Services Access Project (EHSA) in Myanmar implemented by the Ministry of Health and financed by the world bank/IDA loan. The project investments may cause some potential adverse environment impacts associated with small scale renovation activities planned for selected health care facilities and provision of medical equipment that can generate waste. The document aims to guide the project implementation of the proposed project activities, including improving the hygiene conditions linked to the handling and disposal of the health care waste, and those environmental risks concerning mismanagement of waste in general.

The Government of Myanmar and the World Bank evaluated that some aspects of the EHSA project's implementation could lead to an increase in site-specific environmental and health risks. This Environmental Management Plan (EMP) has been developed to meet the project recognized potential of health care activities in creating additional waste that may be hazardous to human health and the environment. In this respect it is important to ensure that when such waste is generated by the project activities there must be safe and reliable methods for its handling to avoid any public health consequences and any significant impact on the environment. Overall, this is call for public awareness strengthening and for sound waste management system to be put in place at the project area of intervention.

The EMP includes two main parts: (i) An Environmental Codes of Practice (ECOPs) to be implemented by contractors (or those responsible) for health care facilities renovation/refurbishment activities financed by the project; and (ii) A

general waste management plan to be followed by health care facilities (HCFs) receiving relevant financing under the project as described in project components and within the project main development objective.

The methodology used to provide the information in this document has been based on person-to person interviews of relevant stakeholders¹, direct observation of activities during field visits at selected health care facilities in Yangon Region (Twantay Township) and Chin State (Paletwa and Ye Townships), and brief desk literature review. The health care facilities selected for site visits have been considered typical of the project coverage based on the Ministry of Health guidance. Special care was taken to include areas that could provide fair knowledge about the current practices in medical waste management in various health care facilities.

The samples drawn in the two provinces visited include the township hospitals, rural health centers (RHCs), and health sub-centers. The project has national coverage and will include all townships. Therefore, based on this document, and the feedback that will be captured during the continuous consultative process with stakeholders as part of project implementation, simple site-specific Environmental Management Plans (EMPs) including actual site assessment and additional relevant information may need to be developed during project implementation.

3.2 Environmental and Institutional Policies and Legislative Framework

Myanmar Health Policy framework in line with the National Comprehensive Development Plan (Health Sector) (2011 to 2030-31), the current policy and institutional reform in the health sector includes development of priority areas in seven programs including health system strengthening (policy and legislation; universal health coverage and strengthening information health system). Yet, the existing legislation does not adequately address issues of healthcare waste management.

Also coordination and supervision of medical waste at all levels in the country is not clearly developed and needs further strengthening while a National Action Plan should be implemented to manage practices at all levels in an integrated health system.

National Legislation on the management of hazardous wastes such as pesticides, certain industrial wastes etc., is not clearly developed and national guidelines for the management of medical wastes are still to be formulated to complement standards on clinical policies and procedures and to follow monitoring practices. Relevant Legislation addressing environmental health issues: There are fifteen legislations pertinent to environmental health in Myanmar such as:

(a) Forestry Law(1992)

This law is to promote the sector of public cooperation in implementing the forestry policy and the environmental policy of the government. And also, this law is to develop the economy of the State, to contribute towards the food, clothing and shelter needs of the public and for perpetual enjoyments of benefits by conservation and protection of forests.

(b) Protection of wildlife and Wild Plants and Conservation of Natural Areas Law (1994)

This law objectives are to implement the policy of protecting wildlife of the State, to implement the policy of conserving the protected areas of the State, to carry out in accordance with International Conventions agreed by the State in respect of the protection of wild species of both flora and fauna and representative ecosystems occurring in the country, to protect endangered species of wild flora and fauna and their habitats, to contribute for the development of research on natural science, to establish zoological gardens and botanical gardens for the protection of flora of fauna.

(c) Public Health Law (1972)

The law is concerned with protection of people's health by controlling the quality and cleanliness of food, drugs, environmental sanitation, epidemic diseases and regulation of private clinics.

(d) Factory Act (1951)

This factory act provides that factories shall arrange health and safety training and courses as recognized by the Ministry of Labor, Employment and Social Security for their supervising staff.

- (e) Territorial Sea and maritime Zone Law (1977)

Subject to the provisions of this Law, ships of all States other than warships shall enjoy the right of innocent passage through the territorial sea. Passage shall be deemed to be innocent so long as it is not prejudicial to the peace, good order or security of Myanmar.
- (f) National Environment Policy (1994)

The purpose of this National Environmental Policy is to provide long-term guidance for government, civil society, the private sector and development partners in Myanmar on environment and sustainable development objectives in Myanmar.
- (g) Draft Environment Law (2000)

This law is to enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations.
- (h) Mines Law (1994)

These law objectives are to implement the mineral resources policy of the government and to protect the environmental conservation works that may have detrimental effects due to mining operations.
- (i) Plant Pest Quarantine Law (1993)

The objectives of this law are to prevent quarantine pests from entering into Myanmar by any means, to suppress effectively the spread of quarantine pests, to carry out, if necessary, disinfestations, disinfection treatment of plant or product to be exported and this issuance of phytosanitary certificate.
- (j) Fresh water Fisheries Law (1991)

The law objectives are to safeguard and prevent the destruction of freshwater fisheries waters and to manage the fisheries and to take action in accordance with the law.
- (k) Marine Fisheries Law (1990)

Marine Fish Products means fishes obtained from the sea, aquatic organisms, their excreta, scales, bones, skins, plants, non-living things.

(l) Pesticide Law (1990)

The pesticide means chemicals used in preventing and controlling insects, arachnids, organisms causing plant diseases that interfere with or destroy crops, food, human beings, animals and other things.

(m) Law on Fishing Rights of Foreign Fishing Vessels (1989)

When an offence committed under this law is sent up for trial, things seized in accordance with law such as fishes, vessels and fishing implements, other articles which are not practicable to be produced easily before the court are not required to be produced before the court as exhibits; instead, report or other supporting documents.

(n) Law on Aquaculture (1989)

Aquaculture means the propagation of fish species, breeding of fish through different stages of growth in natural or artificial waters by various breeding techniques.

(o) Irrigation Laws and Regulations (1982)

Myanmar nationality currently recognises three categories of citizens, namely citizen, associate citizen and naturalised citizen, according to the 1982 Law.

In addition, the Law on Environmental Impact Assessment drafted in 2004 is currently under revision including its affiliated guidelines. Further, a list of national existing Laws relevant to the health sector is presented in Annex 1. Finally, Myanmar is a party to a number of international agreements related to environment and environmental health.

3.3 Institutional Arrangements in Health System

The National Health Committee (NHC) was formed on 28 December 1989 as part of the policy reforms. It is a high level inter-ministerial and policy making body concerning health matters. The health matters are under the responsibility of the Ministry of Health. The Ministry of Health is headed by a Union Minister who is assisted by two Deputy Ministers. There are seven departments within the Ministry of Health, each responsible for different aspects of health care, such as: Department of Health (responsible for provision of health services and deployment of health workers); Department of Health Planning (responsible for developing the National

Health Plan and managing the health information system); department of Medical Sciences (responsible for the production of health workers); Department of medical Research for Lower Myanmar and Upper Myanmar (responsible for conducting medical research and provide evidence based data for policy making); Department of Traditional Medicine (responsible for the development of Myanmar traditional Medicine); and Department of Food and Drug Administration(responsible for the safety and quality of food, drugs, medical devices and cosmetics).

Overall, the Department of Health Planning is responsible for formulation, monitoring and evaluation of the National Health Plan and department of Health has primary responsibility for health service provision for the entire population of the country. Department of Health planning obtains information from various sources within the Ministry of Health and other stakeholders and disseminates the information through regular publication and consultation. In Myanmar, health services are provided by the public, private and non-government organization (NGO) sectors.

The health system is decentralized, with services being offered to patients at the village, township, district, state/ regional and national level. The health system is networked by 1,558 rural health centers (RHC) under the administration of the Township Medical Office (TMO). Each township serves approximately 100,000 to 200,000 people and is responsible for providing primary and secondary care services. At each RHC, about 20,000 people are served by a team of health workers known as Basic Health Staff (BHS). Within each township, there is one township hospital with 16, 25 or 60 beds; at least 1-2 station hospitals; and 4-7 RHC.

In line with the National Health Policy NGOs, both national and international, are also taking some share of service provision and their roles are also becoming important as the needs for collaboration in health become more prominent.

Medical Waste Management practices in Myanmar are substandard although there is basic awareness in all levels about the importance of protecting health workers, visitors to health care facilities and communities living within the vicinity of medical waste. Cities are responsible for collecting medical waste. Both YCDC and MCDC collect medical waste from large hospitals and special clinics on a daily basis while collection service is provided to smaller facilities once a week or on an on-call basis.

Three different color bags are used for separating the waste:

- (i) Blue or Green (YCDC)/black (MCDC) for non-hazardous medical waste uncontaminated with infectious or pathogenic agents (food residues, paper, card board and plastic wrapping);
- (ii) Yellow for pathological waste, infectious waste as well as items that have been used for medical care; and
- (iii) Red for sharps, mainly, but not exclusively, auto-disable or disposal syringes with needles and pharmaceutical waste that consists of outdated drugs or expired unfinished medical solvents. Infections waste is incinerated or burned in cemeteries while sharp wastes are buried underground in landfills. Other waste is treated as domestic waste.

Though there is incomplete information on the current levels of medical waste generation in the country, YCDC and MCDC estimate that on average the medical waste that is generated comprises 280 and 779 tons per year, respectively. A significant portion of this (over 70%) is infectious waste.

Current Status of Medical Waste Management in Myanmar

There are six departments under the Ministry of Health and Sports such as (1) Department of Public Health and Department of Medical Services, (2) Department of Human Resources for Health, (3) Department of Medical Research, (4) Department of Traditional Medicine, (5) Department of Food and Drug Administration and (6) Department of Sports and Physical Education.

Those who need special care are referred to Station Hospital, Township Hospital, District Hospital and to Specialist Hospital successively. Tertiary-level care hospitals exist in Yangon, Mandalay and Nay Pyi Taw with over 20 specialist discipline, fully equipped for tertiary-level care services including intensive care. Some of these also function as teaching and training hospitals for both undergraduate and post graduate medical students. Specialist hospitals, such as women's hospitals, children's hospitals, orthopaedic hospitals, eye/ear nose and throat hospitals and psychiatric hospitals are situated in the cities of Yangon, Mandalay and Taunggyi.

At the State/Regional level, the State/Regional Health Department is responsible for State/Regional planning, coordination, training and technical support, close supervision, monitoring and evaluation of health services. Supportive radiology and clinical laboratories are also provided at this level. At the peripheral level, i.e. the township level actual provision of health services to the community is undertaken.

In the public sector, Rural Health Centres (RHCs), sub-RHCs, Maternal and Child Health (MCH) Centres, Urban Health Centres (UHCs) provide ambulatory care and patients' first point of contact with the health system. The following Table (3.1) is health facilities in Myanmar.

Table (3.1) Health Facilities in Myanmar

Particular	Number
Government Hospital	1118
(a) Central	(a) 37
(b) District	(b) 68
(c) Township	(c) 258
(d) Station	(d) 755
Public Health Center	
(a) Rural Health Centers	(a) 1778
(b) Sub-Centers	(b) 9083
Traditional Medicine Hospital	
(a) Central	(a) 3
(b) State and Region	(b) 9
(c) District	(c) 6
(d) Township	(d) 12
Private Health Center	
(a) Hospital	(a) 206
(b) Clinic	(b) 4776
(c) Dental Clinic	(c) 855

Source: Ministry of Health and Sports

According to the information from Ministry of Health and Sports (Table 3.1), there are 1118 number of government hospital, 1778 number of rural health centers, 9083 number of sub-centers, 30 number of traditional medicine hospital, 206 number of private hospital, 4778 number of private clinic and 855 number of private dental clinic.

The major sources of health waste in the country are hospitals (at tertiary, district, primary levels and private), healthcare facilities (RHC, Sub-center, Urban Health Centre), Laboratories (national, public, Private), research Institutions, blood bank, mortuary and autopsy center and the Military Medical Service. Minor sources are general practitioners (medical, dental, traditional medicine), nursing homes for elderly, acupuncturists, ambulance services and home treatment.

The country has laws and policies such as the Public Health Law 1972 and national Health Policy 1993 in place wherein health and environmental protection are explicitly mentioned. However there is no separate legislation or policy on medical waste management. There is a plan to develop them in future.

The estimated quantity of medical waste generated by various health facilities in two big cities of Yangon and Mandalay is around 1.5 tones/day. Yangon had a good HCWM system from 1966 to 2000 but it become weak after that.

According to the hospital management manual of 2011, each hospital should have a medical waste management committee chaired by the Medical Superintendent with microbiologist or pathologist as secretary and with ward in charges, pharmacist, hospital engineer and sister-in-charge as members. The current practice is to segregate waste in three color coded bins-general waste in black bin, infectious waste in yellow bin and highly infectious waste in red bin. Infections waste are incinerated, sharps, syringes and needles are buries in deep concrete wells and general waste is disposed with medical waste.

The occupational and environment health division of the Department of Public Health is implementing HCWM project with the support of the World Bank. It is a three-year project from 2016-2018. The project will review the current status of HCW in Myanmar, develop standard 11 operating procedures for HCWM and also develop guideline and policy.

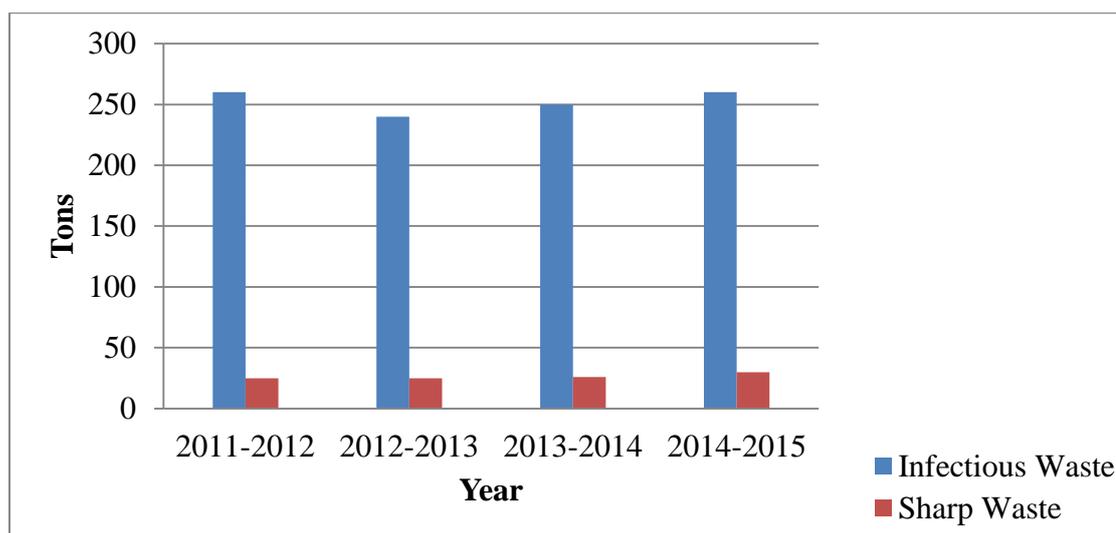
A pilot study has been conducted in Mon State and the data is under analysis. Myanmar ratified the Basel Convention in 2015 and the Stockholm Convention. The country does not consider incineration as a suitable option in future and feels the need to shift to non-burning methods for waste. Table (3.2) and Figure (3.1) show the medical waste generation in Yangon.

Table (3.2) Medical Waste Generation in Yangon

Year	Infectious Waste (Tons)	Sharp Waste (Tons)
2011-2012	260	25
2012-2013	240	25
2013-2014	250	26
2014-2015	260	30

Source: Yangon City Development Committee (2016)

Figure (3.1) Medical Waste Generation in Yangon



Source: Yangon City Development Committee (2016)

3.4 Overview of Solid Waste Management

Myanmar has been facing considerable challenges with the management of waste as a result of increasing income and consumption levels, urban population growth, and lack of effective waste treatment and disposal options. In this regard, the

country's Environmental Conservation Law was established with the objective of enabling the implementation of the Myanmar National Environmental policy, which was enacted in 2012. Environmental Conservation Rules have also been developed for the implementation of the Law.

Accordingly, Myanmar's environmental conservation law and rules emphasize that the development of national and local waste management strategies are urgently needed. Further to a request for support from Myanmar's Ministry of Environment Conservation and Forestry (MOECAF), the International Environmental Technology Centre (IETC) of the United Nations Environmental Programme (UNEP) has been actively working with national and local governments and other institutions to build capacity for waste management and promote the development of conducive policy framework and strategies. In this regard, the IGES – Centre Collaborating with UNEP on Environmental Technologies (CCET) was selected to provide technical assistance towards the development of waste management strategies at the national and city levels based on a holistic waste management approach: addressing waste in all the forms (solid waste, liquid waste / wastewater, and gaseous emissions), primarily focusing on solid waste but also covering other forms of waste in accordance with the intention and capacity of respective national and local governments.

3.4.1 Waste Generation

The industrialization, rapid urbanization, economic growth and changes in consumption patterns have been accompanied by immense challenges in managing the country's solid waste. However, currently there is no accurate and reliable data on the total waste generation in the country. According to the estimation of the World Bank (2012), the current solid waste generation in Myanmar was 5.616 tons/day with the per capita waste generation of 0.44 kg/capita/day. This figure was expected to reach about 21,012 tons/day with 0.85 kg/capita/day by 2025.

Out of the total waste generation in the country, approximately 55% is generated by three major cities including Mandalay (955 tons/day), Yangon (1,981 tons/day), and Nay Pyi Taw (160 tons/day). Due to the rapid increase of waste generation, both Mandalay and City Development Committees have prioritized solid

waste management as issues of immediate concern, both in terms of the environment and public health.

Table (3.3) Increase of Waste Generation in Mandalay

Year	Tons
2005	230
2010	470
2015	980

Source: Mandalay City Development Committee, 2016

Above from Table (3.3), the waste generation in Mandalay is increased from 230 tons/day to 980 tons/day within ten years period.

According to Yangon City Development Committee (2016), the waste generation in Yangon has 1000 tons/day in 1983, 1250 tons/day in 1991, 1300 tons/day in 2000 and 1800 tons/day in 2015 as shown in Table (3.4)

Table (3.4) Increase of Waste Generation in Yangon

Year	Tons
1983	1000
1991	1250
2000	1300
2015	1800

Source: Yangon City Development Committee, 2016

Municipal solid waste is defined as the “non-gaseous and non-liquid waste” that results from the daily activities of community’s residential and commercial sector within a given administrative urban area. Myanmar’s municipal solid waste is generated from households (60%), markets (15%), commercial (10%), hotel (2%), garden (5%) and others (8%). The municipal solid waste is composed mainly of organic materials (77%) while the remainder comprises plastic (13%), paper (7%),

and others (3%). This has been largely confirmed by observation and evaluation of the waste composition of Yangon and Mandalay.

3.4.2 Waste Collection

Traditionally, waste collection and disposal in Myanmar have been the responsibility of local municipal authorities. In Yangon, Mandalay and Nay Pyi Taw, autonomous City Development Committees and their Pollution Control and Cleansing Departments (PCCDs) with their network of administrative branches and sub-units are tasked with solid waste management in municipal areas. In other parts of the country the respective Township Development Committees under the Local Government, were manage municipal waste collection and disposal. The following Table (3.5) is waste collection ratio in Yangon.

Table (3.5) Waste Collection Ratio in Yangon

Year	Percentage
1983	39
1991	41
2000	54
2005	80
2015	92

Source: Yangon City Development Committee, 2016

Municipal solid waste collection systems in Myanmar cities can largely be characterized as labor intensive, relying on the use of both manual workers and non-specialized vehicles. Waste collection capacity, as measured by the ratio of solid waste collected to total waste generated, has been increasing for many major cities. In general, the current waste collection system includes primary and secondary collection. Primary collection takes place in different forms such as door-to-door (bell collection), block, and container collection methods. The primary waste collection system is carried out either or in combination of push carts and tri-bicycles while secondary collection system is performed mainly with tipper trucks (dumpers).

3.4.3 Promotion of 3R (reduce, reuse and recycle) activities

Most cities in Myanmar conduct public awareness raising campaigns and environmental education programmes for local residents to mobilize support for waste reduction and reuse activities. For example, the MCDC has prohibited the production, trading and using the thin plastic bags in its administrative area and use of alternative bags such as string bags, leaves boxes and baskets have been introduced since 2009. Similarly, public awareness programmes have also been implemented by MCDC to promote sustainable lifestyles.

Recycling activities are carried out in many cities in Myanmar mostly by the informal sector, including scavengers, waste collectors, and waste dealers. The scavengers and waste collectors collect recyclable materials such as newspapers, metal, plastic bottles, tin and glass from households, communal depots, streets, commercial areas and final disposal sites and in turn sell these items to waste dealers who subsequently clean, sort, store and sell them in bulk to the recycling industry both locally and for export.

Currently there is a lack of accurate and reliable data on recycling volumes, ratio and the number of recycling factories in the cities. However, a sample survey carried out in Yangon City identified that 86 tons of recyclable materials are directed to the waste dealers per day. Out of this total 57% was glass; cardboard and paper accounted 15% and 13%, respectively. In addition, plastic (7%), tin cans (7%) and other materials such as metal, iron and steel, (1%) are also collected.

3.5 Medical Waste Management

Overall, medical waste management practices in Myanmar are substandard although there are basic awareness at all levels about the importance of protecting health workers, visitors to health care facilities and communities living within the vicinity of medical waste. Cities are responsible for collecting medical waste. Both YCDC and MCDC collect medical waste from large hospitals and special clinics on a daily basis while collection service is provided to smaller facilities once a week or on an on-call basis.

Three different color bags are used for separating the waste: (i) blue or green (YCDC)/ black (MCDC) for nonhazardous medical waste or domestic waste uncontaminated with infectious or pathogenic agents (food residues, paper, cardboard and plastic wrapping); (ii) yellow for pathological waste, infectious waste as well as items that have been used for medical care; and (iii) red for sharps, mainly, but not exclusively, auto-disable or disposal syringes with needles and pharmaceutical waste that consists of outdated drugs or expired unfinished medical solvents.

Infectious waste is incinerated or burned in cemeteries while sharp wastes are buried underground in landfills. Other waste is treated as domestic waste. Though there is incomplete information on the current levels of medical waste generation in the country, YCDC and MCDC estimate that on average the medical waste that is generated comprises 280 and 779 tons per year, respectively. A significant portion of this (over 70%) is infectious waste.

3.6 Treatment and Final Disposal of Waste Management

At present, waste collected by municipalities is transported to designated dumping sites located within city boundaries. A number of dumping sites that are used for waste dumping were identified in Yangon City and Mandalay City. These are often located about 10 to 25 km away from the city's CBD (central business district) area and were found to comprise approximately 1 hectare or so. The typical duration for dumping in line with onsite capacity was found to be one or two years to a maximum of five years at most. Most dump sites face challenges in terms of operations and management. Transported waste is unloaded on the ground or onto existing waste. Waste is subsequently sorted by waste pickers by hand and manual tools, such as rakes. Following manual sorting, unsorted waste is moved further inside the dumpsite by using mechanical equipment, such as bulldozers. Sorted waste is thereafter packed, stored and transported back to the city for resale.

Landfill fires are common which generates dense smoke and noxious fumes. In addition to offensive odors, uncontrolled dumps pose a number of health hazards including from pathogenic organisms, insects, rodents as well as air pollution from dust, accidental burning, and ground and surface water pollution from issues of unaddressed leachate. It was found that composting was introduced by YCDC in 1999

with an aim to reduce the amount of organic waste sent to landfill with the additional benefit of generating natural fertilizer for farmers. The following Table (3.6) shows the landfill operation in five locations at Yangon Region.

Table (3.6) Landfill Operation in Yangon

Location	Capacity (Tons/day)	Condition	Remarks
Hteinpin	1080	Open dumping	Operating
Dawai Chang	843	Open dumping	Operating
Shwepyithar	61	Open dumping	Operating
Mingalardon	43	Open dumping	Operating
Dala	33	Open dumping	Operating
Seikiyi Khanaungato	4	Open dumping	Operating

Source: Yangon City Development Committee, 2016

Mandalay City Development Committee has operated an anaerobic digester (30 tons/day) in Pathein Gyi to treat organic waste collected from the rural part of the city. MCDC also installed an incinerator in Thaug Inn Myount Inn (South) landfill to treat municipal waste (30 tons/day). At present, these are not operational. This indicates that the introduction of waste treatment technologies is still in the early stages, and that measures should be taken to ensure a stepwise transition from pilot to full scale modification of existing MSWM practice. The Mandalay City Development Committee has landfill operation in six locations at Mandalay Region. (Table 3.7)

Table (3.7) Landfill Operation in Mandalay

Location	Capacity (Tons/day)	Condition	Remarks
Kyar Ni Kan (North)	450	Open dumping	Operating
Thaug Inn-Myaunt Inn	300	Open dumping	Operating
New Bway Factory	142	Open dumping	Operating
New Kandawgyi Lake	80	Open dumping	Operating
New Zangkalaw Pond	28	Open dumping	Operating
Corner of N/E Mandalay	450	Open dumping	Operating

Source: Mandalay City Development Committee, 2016

CHAPTER IV

SURVEY ANALYSIS

This chapter presents the survey profile, survey design and survey findings of medical waste management in No. (2) Military Hospital (500- Bedded) at Dagon Township, Yangon.

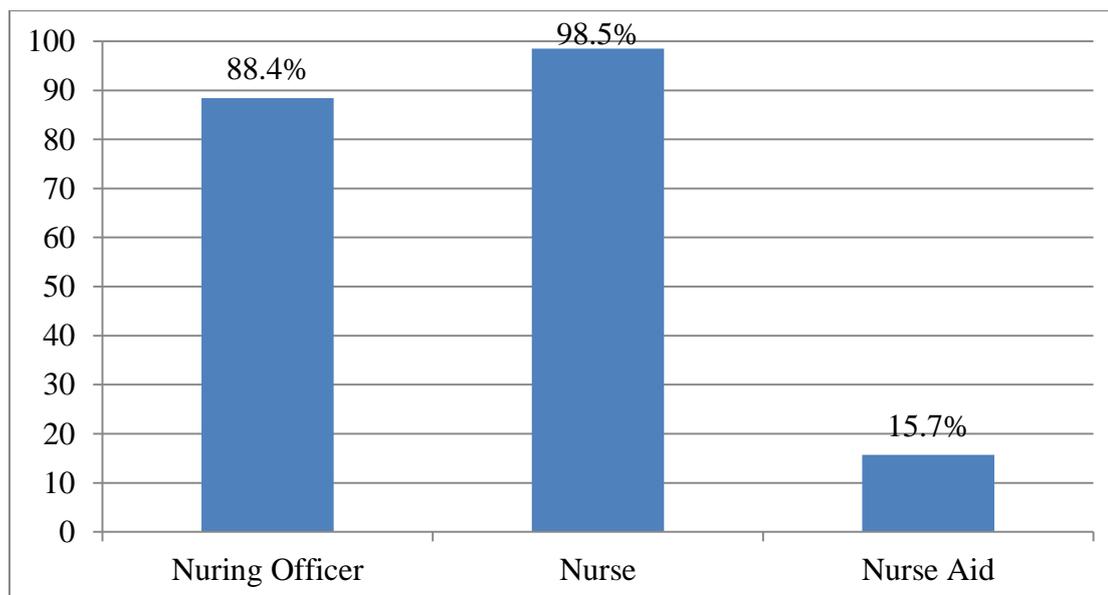
4.1 Survey Profile

The survey area is conducted on No. (2) Military Hospital (500-bedded) at Dagon Township, Yangon Region. It was established in 18th January, 1948 as a Central Medical Investigation Room. In 1st June 1949, it was reformed as a No. (1) Field Hospital. In 1950, this hospital was upgraded to No. (7) Cantonment Hospital and No (2) Military Hospital (100-bedded) in 1963. In 17th April 1990, it was step by step upgrade from (100-bedded) to (500-bedded) together with new specialist departments and extension of new building.

No. (2) Military Hospital is tertiary referral type of teaching specialist hospital and sanction 500 bedded. This hospital organized with medical ward, surgical ward, medical oncology ward, surgical oncology ward, obstetrics and gynecology ward, pediatric ward, eye ward and dental ward. Specialist or general outpatient department and emergency department are given service care for military person and their families. Moreover, mobile team services for health care concern with public. No. (2) Military Hospital (500-bedded) is a core of teaching place for under graduate, post graduate and doctorate medical students because fulfillment of specialties for learning.

The man power of care giver (nursing officer, nurse and nurse aid) from studies hospital showed as following Figure (4.1).

Figure (4.1) The Man Power of Care Giver in No. (2) Military Hospital



Source: Survey data, 2019

4.2 Survey Design

The survey is conducted on the No. (2) Military Hospital (500 Bedded) at Dagon Township, Yangon Region. The survey period is within September, 2018 to July, 2019. This study mainly used a descriptive method using structured questionnaires. Data were collected from both primary and secondary sources. The primary data was collected with 90 persons using structured questionnaire at No. (2) Military Hospital (500 Bedded) at Dagon Township, Yangon Region.

The structure questionnaire had multiple choice questions in which the researcher provided a choice of answers and respondents were asked to select one or more of the alternatives and dichotomous questions that had only two response alternatives, yes or no. And also used five point 'Likert Scale' (1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly agree). Collected data were tabulated, analyzed and interpreted in the light of objective of the study by applying descriptive statistics.

This questionnaire consists of four different parts. The first part is the characteristics of respondents and the second part on their knowledge of medical waste management. The third part is their attitude towards medical waste management. The final part consists of practice of waste management.

The secondary data was obtained from the government official reports and records of the Ministry of Health and Sports and through internet, libraries, publication and review of record, return and report from the surveyed hospital. More information were obtained from (KII) Key Informant Interview such as DSGH (1000 Bedded), DSOH (500 Bedded) DSOGCH (300 Bedded) and DSLH in Yangon. In-depth interviews were also conducted from (20) respondents from No. (2) Military Hospital (500 Bedded).

4.3 Survey Findings

The survey findings are presented below in four sections: (1) demographic characteristics, (2) about knowledge on medical waste management, (3) about attitude on medical waste management and (4) about practice on medical waste management.

4.3.1 Characteristics of Respondents

The first part of the questionnaire was design to collect characteristics of respondents such as gender, age, designation/rank, department (wards and units), educational qualification and working experience.

Table (4.1) Characteristics of the Respondents

No	Descriptions	Characteristics	Respondents	Percentage
1	Gender	Male	61	68
		Female	29	32
		Total	90	100
2	Age distribution	20-30 years	47	52
		31-40 years	23	25
		41-50 years	15	17
		51-60 years	5	6
		Total	90	100
3	Designation/Rank	Nurse Officer	43	48
		Nurse	38	42
		Nurse Aid	9	10
		Total	90	100
4	Department (Wards and Units)	Medical Ward	25	28
		Surgical Ward	21	23
		OG Ward	13	15
		Pediatrics Ward	12	13
		Others	19	21
		Total	90	100
5	Educational Qualification	Diploma	23	26
		Graduate	58	64
		Post Graduate	9	10
		Total	90	100
6	Working Experience	Under 1 Year	3	3
		1-10 Years	48	53
		10-20 Years	25	28
		20-30 Years	14	16
		Total	90	100

Source: Survey Data, 2019

Above from Table (4.1), within the age group the highest number of respondents (47 respondents or 52%). have between 20 years to 30 years. However, the majority of the respondents are between 20 to 40 years making up a total of 70 respondents or 78% of the total respondents. For gender, there 61 of total respondents (68%) are males and the remaining 29 respondents or 32% are female showing that males number is larger than female number.

Designation/Rank status shows the majority of total respondents, work as nurse officer 43, or 48%. The next is nurse with 38 respondents (42%). So, among the respondents it can be states as the majority of respondents, 90% are nurse officer and nurse.

For department status, 25 respondents (28%) of the total respondents work in medical ward. 21 respondents (23%) of the total respondents work in surgical ward. Among these respondents, 51% work in the wards which out the many medical waste.

The education status of respondent shows the most of 58 respondents (64%) are the graduate. The most of respondent 48 (53%) have one to ten year experience show in working experience status.

4.3.2 Knowledge of Medical Waste Management

The second part of this questionnaire was design to collect awareness and knowledge of medical waste management, medical waste things knowledge and harmful awareness for medical waste management.

(a) Training Attended and Knowledge

Training attended and knowledge is shown in Table (4.2).

Table (4.2) Training Attended and Knowledge

Training	Known	Do not Known	Total	Percent
Attended Training	57	18	75	83
Don't Attend Training	7	8	15	17
Total	64	26	90	100

Source: Survey Data, 2019

In Table (4.2), 75 respondents out of total attended medical waste from hospital training well and 15 of respondents do not attend at all. Moreover, 64 of 90 respondents know medical waste awareness and 26 don't know medical waste awareness. 18 of attended training staff respondents do not know medical waste awareness.

(b) Knowledge on Types of Medical Waste

Knowledge on types of medical waste is shown in table (4.3).

Table (4.3) Knowledge on Types of Medical Waste

Descriptions	TRUE	%	FALSE	%	Unknown	%
Paper and stationery	18	20	64	71	8	9
Waste materials from Kitchen, laundry and Stores	32	36	48	53	10	11
Used hypodermic needles, syringes, intravenous sets, blood sets	86	96	4	4	0	0
Food residues and other food materials	31	34	54	60	5	6
Used dressing, bandages and sticking plaster, gloves and masks	86	96	4	4	0	0
Residuals of cytostatic medicines (after chemotherapy)	85	94	5	6	0	0
Packing materials and drug bottles	73	81	11	12	6	7

Source: Survey Data 2019

In table (4.3) shows 86 respondents (96%) answered that used hypodermic needles, syringes, intravenous sets, blood sets are medical waste. Moreover, they asked used dressing, bandages and sticking plaster, gloves and masks are medical waste are medical waste things. 48 respondents (53%) asked waste materials from Kitchen, laundry and Stores are Medical Waste is not medical waste.

(c) Medical Waste Harmful to Human and Environment Knowledge

Medical waste harmful to human and environment knowledge is shown in Table (4.4).

Table (4.4) Medical Waste Harmful to Human and Environment Knowledge by Respondents

Descriptions	No. of Respondents	Percentage
Unknown	2	2
Not Harmful	0	0
Harmful	88	98
Total	90	100

Source: Survey Data 2019

In table (4.4), 88 respondents or 98% said that medical wastes are harmful to human beings and environment but 2 respondents do not know this awareness.

(d) Hazardous Waste

Table (4.5) Knowledge of Hazardous Waste

No	Description	Yes	(%)	No	(%)	Don't Know	(%)
1	Residuals of cytostatic medicines (after chemotherapy)	57	63.3	24	26.6	12	13.3
2	Old and unused X-ray film	47	52.2	38	42.2	8	8.8
3	Used hypodermic needles, syringes, intravenous sets and blood sets	81	90	12	13.3	-	
4	Broken thermometer and blood pressure cuff	72	80	17	18.8	4	4.4
5	Human tissues and organs from operation theatre	86	95.5	7	7.7	-	
6	Food residues and other food materials	42	46.6	51	56.6	-	

Source: Survey Data 2019

Above from table (4.5), 63.3 percent of respondents have the knowledge of residuals of cytostatic medicines wastes but 26.6 percent of respondents do not have the knowledge. 47 percent of respondents have knowledge of old and unused X-ray film wastes but 42.2 percent of respondents do not have knowledge. 90 percent of respondent have knowledge of used hypodermic needles, syringes, intravenous sets and blood sets wastes but 13.3 percent of respondents do not have knowledge. 80 percent of respondents have knowledge of Broken thermometer and blood pressure cuff wastes but 18.8 percent of respondents do not have knowledge. 95.5 percent of respondents have knowledge of human tissues and organs from operation theatre wastes but 7.7 percent of respondents does not have knowledge. 46.6 percent of respondents have food residues and other food materials waste but 56.6 percent of respondent have knowledge of food residues and other food materials wastes.

4.3.3 Attitude towards Medical Waste Management

The third part of this questionnaire was design to collect attitude on medical waste management. Table (4.6) shows the mean value of five responses – attitude on medical waste management received by respondents. The mean value of safe waste disposal is of utmost important to prevent infection transmission for respondents are higher than the others. In general, the respondents strongly agreed that safe waste disposal is of utmost important to prevent infection transmission.

The mean value of personal protective equipment such as gloves, masks and caps are needed to wear in handling of healthcare waste is slightly higher than others. In general, the respondents feel that the personal protective equipment should wear to handle medical waste.

For the mean of in practice, the color coding system for waste segregation is useless is lowest than others. In general, the respondents do not accept the color coding system for waste segregation. Moreover, the mean value of your daily work can be disturbed because of the waste segregation system is lower than the others. In general, the respondents feel that the waste segregation can be distributed their daily works.

Table (4.6) Attitude of Medical Waste Management

Descriptions	Mean
All health staffs should have sound knowledge in waste segregation system	4.27
There should be a priority on safe waste segregation and disposal	4.23
Safe waste disposal is of utmost important to prevent infection transmission	4.34
Efforts in safe waste disposal are a financial burden on the hospital	3.34
The infectious waste should be disposed after disinfections	3.84
Residual from chemotherapy after treating cancer patients(e.g. used bottles, syringes, drip sets, etc.) should be disposed with plastics bags or container labeled 'Danger'	4.10
Personal protective equipment such as gloves, masks and caps are needed to wear in handling of healthcare waste.	4.32
Your daily work can be disturbed because of the waste segregation system	2.86
In practice, the color coding system for waste segregation is useless	2.83
Health care waste can cause serious harm to community and environment if not managed properly	4.17
Do you like to cooperate with hospital waste management committee or team?	3.94
Safe waste disposal is responsibility of the institution and not an individuals	4.00
There should be supervisors for hospital waste segregation and disposal of health care providers.	3.83

Source: Survey Data 2019.

4.3.4 Practice towards Medical Waste Management

The final part of this questionnaire was design to collect attitude on medical waste management.

Table (4.7) Practice of Medical Waste Management

Descriptions	Mean
Do you dispose health care waste according to the color coding system	2.12
Do you use personal protective equipment in handling of medical waste for disposal	1.67
Do you waste your hands after handling of health care waste and after disposal	1.08
Do you recap the used needles for disposal	1.47
When your working partners do not dispose health care waste according to the color coding system, do you tell them that it is wrong	2.02
Do you report to ward in charge or keep records in cases like injuries due to hazardous health care waste	2.20

Source: Survey Data, 2019

Above from Table (4.7), the mean of three responses – practices on medical waste management received by respondents. The mean value of report to ward in charge or keep records in cases like injuries due to hazardous health care wastes is higher than the others. In general, the respondents strongly do that report to ward in charge to hazardous medical waste especially injuries case.

The mean value of dispose health care waste according to the color coding system is slightly higher than the others. In general, the respondents strongly do that they use color coding system when they recycled the medical waste.

4.3.5 In-Depth Interview Findings

From the survey respondents, (20) respondents were selected for in-depth interview. An interview guideline was used (see appendix II). According to the data, most of the respondents are known about the contamination of infectious diseases are caused by infected blood. Moreover, almost respondents have known side effect of medical waste material. In color coding system, 13 respondents known acceptable answer but 7 respondents were uncertain answer.

According to their responds, they have some problems with disposal of medical waste management. There is no supply color coding bag for disposing; no education training for disposing methods of medical waste, and especially they need proper containers for sharp waste. Instead of using proper color coding system for disposal methods, they used their own unit dustbin.

Therefore, health care providers need to attend training on medical waste management and they need to aware that how dispose medical waste and how to manage the place for disposing.

4.3.6 Key Informant Interview Findings

Key informant interviews are conducted to get vital information from authorized persons (registration officer) about their hospital (DSGH, DSOH, DSOGCH, and DSLH).The interview is use to gather information a needs assessment and utilized the finding for effective prevention, planning information. Therefore, registration officer were also interviewed focus on the medical waste practice, disposal method at their hospital. These key informants are provided information on medical waste at the dumpsite and type of waste that they collect and possible effects of disposed medical care waste on their health.

In conducting key informant interviews to get wide range of information from another hospital concern with medical waste. All interviews were guided interview and data was collected by writing down answer during the interview as well as recording the interview.

According to the interview data, other hospital also had color coding system but it less effective in real situation. Hence they required education training concern with color coding system in their hospital.

All hospitals have their own dumpsite for disposing of medical waste. And then, they contact with YCDC for the management of medical waste material. During disposing the medical waste, they have some effects of disposed such as needle stitch injuries. Most of the dispose people are neglected to that injuries and they never report to senior in charge. Even though almost all health care people know the effect of waste management, they are neglected to do correct practice.

Moreover, they cannot provide fully identifiable container for disposed and cannot spread for dumpsite. There is a high potential of serious threat to spread out various disease and hazard waste due to improper disposal of dumping. Therefore, general waste or solid waste and non-hazardous waste transportation should be kept separate from infectious waste and hazardous waste. Accordingly, they should have proper training and guiding policy to proper medical waste management. Their difficulties problems are an issue of increasing concern, prompting hospital administration to seek new ways and cost effective management of the waste. Based on these data, there is no distinct gap between other hospitals and No 2 Military Hospital in disposing medical waste management.

CHAPTER V

CONCLUSION

5.1 Findings

Health care staffs play a vital role in medical waste management, they may not harm themselves but also share in dissemination of these hazardous medical wastes and they are occupational group vulnerable to some diseases if unaware. This study highlighted the knowledge, attitude and practice on medical waste management among health care providers who are working at No.2 Military Hospital (500 bedded).

In this study, based on the associations found between some background characteristics and knowledge, attitude and practice levels of healthcare providers, it can be concluded that medical waste management training to all health care staff especially and the beginning of their career is essential to raise their knowledge, attitude and practices. There was association between knowledge and attitude of health care providers as well as their attitude and practices. Therefore, health care providers should have good knowledge on medical waste management. Moreover, they would have good attitude towards medical waste management and proper practice on waste management.

According to the findings from both quantitative and qualitative assessment, it can be found that priority of hospital waste management is lower than other services and lack of policy and guidelines concerning medical waste management. Under reporting is also a problem when health care providers got injuries from medical waste. The respondents from quantitative assessment and interviews suggested adding almost efforts on current hospital waste management system by means of effective training program, adequate human resources, materials and financial support.

For gender, there 61 of total respondents (68%) are males and the remaining 29 respondents or 32% are female showing that males number is larger than female number. For department status, 25 respondents (28%) of the total respondents work in medical ward. 21 respondents (23%) of the total respondents work in surgical ward. Among these respondents, 51% work in the wards which out the many medical waste.

The education status of respondent shows the most of 58 respondents (64%) are the graduate. The most of respondent 48(53%) have one to ten year experience show in working experience status. 83.3% of respondents attended medical waste from hospital training well and 16.6% of respondents do not attend all. 86 respondents (96%) answered that used hypodermic needles, syringes, intravenous sets, blood sets are medical waste. 48 respondents (53%) asked waste materials from Kitchen, laundry and Stores are Medical Waste are not medical waste. 88 respondents or 98% said that medical wastes are harmful to human beings and environment but 2 respondents do not know this awareness.

The respondents strongly agreed that safe waste disposal is of utmost important to prevent infection transmission. The respondents feel that the personal protective equipment should wear to handle medical waste. The respondents feel that the waste segregation can be distributed their daily works.

The respondents strongly do that report to ward in change to hazardous medical waste especially injuries case. The respondents strongly do that they use color coding system when they recycled the medical waste.

In conclusion, the current status of health care providers on medical waste management in this study will help the hospital authorities to develop the standard operation procedures and guidelines for improving this situation in future, including plans for better training programed and monitoring of medical waste management system in the study hospital. These findings could also provide baseline information for the development of the formulation of policies at the national level and intervention programs for medical waste management.

5.2 Recommendations

Regarding the study of medical waste management among health care provider at No.2 Military Hospital (500 bedded), following recommendations are suggested. There should be proper and intensive training programs on awareness and practice of waste disposal for all health-care staff including doctors, nurses and general workers with continuous monitoring at regular intervals. These training should not become merely a one-time activity but should be a continuous process in different health care facilities. It is necessary to add more efforts on current medical waste management system by means of adequate human resources, material and financial support. For instances, safety boxes and waste bins should be supplied in sufficient number depending on daily amount of wastes produced in each ward. It should be ensured that the injuries happening to the health care personnel are reported to the ward in charge or in charge of medical waste management committee and they should record it in the standardized forms. There should be Standard Operating Procedures (SOP) and guidelines for health care waste management including color coding system for waste disposal at No.2 Military Hospital (500 – bedded). National strategy for proper management and disposal of health care waste should be formulated and implemented. There should be provided incinerator where medical waste and waste water treatment plant.

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STRUCTURE TYPE OF QUESTIONNAIRE

I am studying Master of Public Administration at Yangon University of Economics. I have designed the following questionnaire for “**A Study on Medical Waste Management System and Practices among the Health Care Personnel of No. (2) Military Hospital in Yangon**” - which requires for my thesis work as an integral part of the study to complete the Master Program.

This questionnaire is concerning knowledge, attitude and practice of health care providers on medical waste management system at No. (2) Military Hospital (500 Bedded) in Dagon Township, Yangon Region.

I would highly appreciate if you answer the following questionnaire and your responses would be strictly confidential. It will take approximately 15-20 minutes. I expect your kind cooperation in this respect. Please put a (✓) mark to indicate your responses. Thank you for your time.

Part (A) Demographic Characteristics

1) Age (Completed) _____ (Years)

2) Gender

(a) Male (b) Female

3) Designation/Rank

(a) Nurse Officer (b) Nurse (c) Nurse aid

4) Department (Wards and Units)

(a) Medical Ward (b) Surgical Ward

(c) Obstetrics and Gynecology Ward (d) Others

5) Educational Qualification

(a) Diploma (b) Degree (c) Post Graduate

6) Working Experience _____ Years _____ Months

Part (B) Knowledge on Medical Waste Management

1) Do you receive training on medical waste management at the hospitals?

(a) Yes (b) No

2) Did you get hepatitis B vaccination for 3 times or booster dose within last 5 years?

(a) Yes (b) No

3) Do you know medical waste?

(a) Yes (b) No

4) Medical wastes include following:

Particular	Yes	No	Don't Know
1. Paper and other stationery			
2. Waste materials from kitchen, laundry and stores			
3. Used hypodermic needles, syringes, intravenous sets and blood sets			
4. Food residues and other food materials			
5. Used dressings, bandages and sticking plaster, gloves and masks			
6. Residuals of cytostatic medicines (after chemotherapy)			
7. Packing materials and drug bottles			

5) Is medical waste harmful to human beings and environment?

(a) Yes (b) No (c) Don't Know

6) Hazardous wastes include:

Particular	Yes	No	Don't Know
1. Residuals of cytostatic medicines (after chemotherapy)			
2. Old and unused X-ray film			
3. Used hypodermic needles, syringes, intravenous sets and blood sets			
4. Broken thermometer and blood pressure cuff			
5. Human tissues and organs from operation theatre			
6. Food residues and other food materials			
7. Do you know treatment and disposal techniques of hospital waste?			

Part (C) Attitude on Medical Waste Management

- 1) All health staffs should have sound knowledge in waste segregation system.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 2) There should be a priority on safe waste segregation and disposal.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 3) Safe waste disposal is of utmost important to prevent infection transmission.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 4) Efforts in safe waste disposal are a financial burden on the hospital.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 5) The infectious waste should be disposed after disinfections.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 6) Residuals from chemotherapy after treating cancer patients (e.g. Used bottles, syringes, drip sets, etc.) should be disposed with plastic bags or container labeled 'Danger'.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 7) Personal protective equipment such as gloves, masks and caps are needed to wear in handling of healthcare waste.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 8) Your daily work can be disturbed because of the waste segregation system.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 9) In practice, the color coding system for waste segregation is useless.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 10) Medical waste can cause serious harm to community and environment if not managed properly.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 11) Do you like to cooperate with hospital waste management committee or team?
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 12) Safe waste disposal is responsibility of the institution (teams work) and not an individual.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree
- 13) There should be supervisors for hospital waste segregation and disposal of health care providers.
(a) Strongly disagree (b) Disagree (c) Neutral (d) Agree (e) Strongly agree

Part (D) Practice on Medical Waste Management

1) Do you dispose medical waste according to the color coding system?

(a) Always dispose (b) Sometimes dispose (c) Never

2) Do you use personal protective equipment in handling of medical waste for disposal?

(a) Always use (b) Sometimes use (c) Never

3) Do you wash your hands after handling of healthcare waste and after disposal?

(a) Always wash (b) Sometimes wash (c) Never

4) Do you recap the used needles for disposal?

(a) Always recap (b) Sometimes recap (c) Never

5) When your working partners do not dispose medical waste according to the color coding system, do you tell them that it is wrong?

(a) Always tell (b) Sometimes tell (c) Never

6) Do you report to ward in charge or keep records in cases like injuries due to hazardous medical waste?

(a) Always report (b) Sometimes report (c) Never

Thank you.

In-Depth Interview Questionnaire

1) Please mention common communicable diseases caused by blood borne pathogens that can be transmitted via infectious and sharp wastes.

2) Please mention the other hazards of health care waste as much as you know.

3) What colors are involved in color coding system currently used in Myanmar for segregation of health care waste in hospitals?

4) Please mention the color coding system for

(a) General waste _____

(b) Infectious waste _____

(c) Sharps waste _____

(d) Pathological waste _____

5) What problems do you encounter in disposal of medical waste?

6) Give your suggestions to improve disposal of medical waste in your hospital?

Interview guide line questions for key informant

1) What is medical waste product?

2) What are the effects of medical waste?

3) Do you have color coding system concern with medical waste at your hospital?

4) How do you manage sharp waste and other medical waste?

5) Where is the dumpsite of medical waste at your hospital?

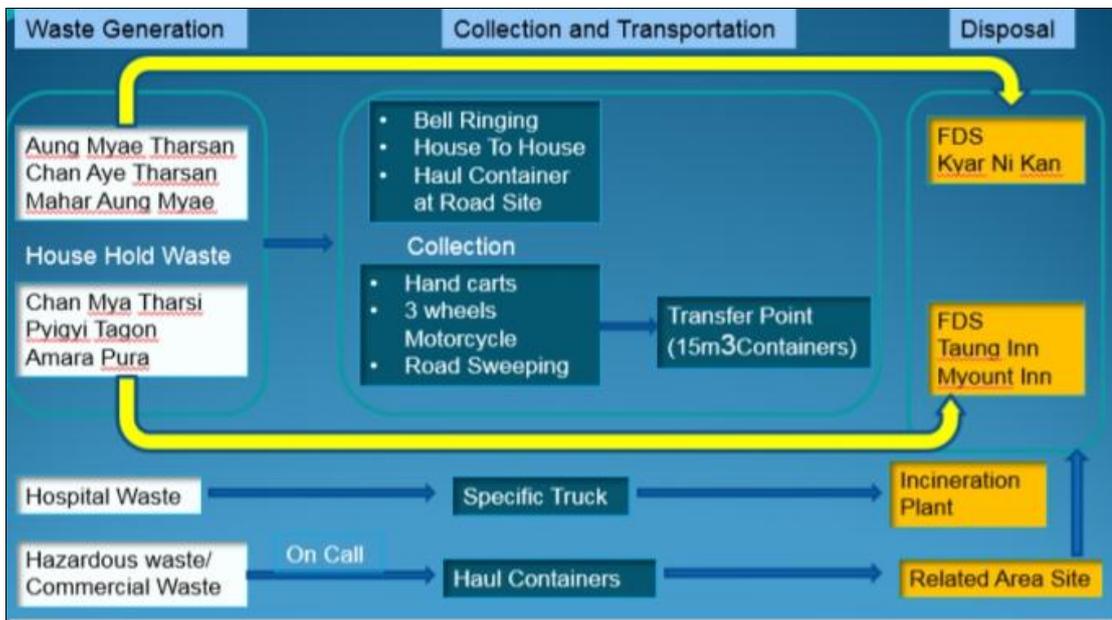
6) What are your difficulties about with medical waste management?

Medical Waste Treatment Process in Yangon



Source: Yangon City Development Committee

Waste Collection System in Mandalay



Source: Mandalay City Development Committee