

**THE DISPOSAL OF MEDICAL WASTES IN HEALTH INSTITUTIONS IN EKITI  
STATE, NIGERIA**

BY

**AIYELABOWO OLAWALE KOREDE**

**WMA/13/1031**

**DEPARTMENT OF  
WATER RESOURCES MANAGEMENT  
AND AGROMETEOROLOGY  
FEDERAL UNIVERSITY OYE-EKITI**  
SIGN \_\_\_\_\_ DATE \_\_\_\_\_

**A PROJECT SUBMITTED TO**

**THE FACULTY OF AGRICULTURE, DEPARTMENT OF WATER RESOURCES  
MANAGEMENT AND AGRO-METEOROLOGY, FEDERAL UNIVERSITY OYE-  
EKITI**

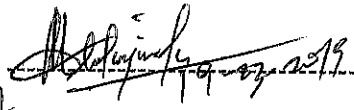
**IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF  
BACHELOR IN WATER RESOURCES MANAGEMENT AND AGRO-  
METEROLOGY DEGREE OF THE FEDERAL UNIVERSITY OYE-EKITI**

**EKITI STATE, NIGERIA**

**FEBRUARY 2019**

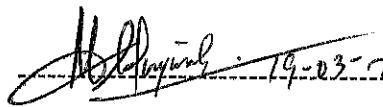
## CERTIFICATION

This is to clarify that this is an original and independent research project carried out by Aiyelabowo Olawale Akorede (WMA/13/1031) in the department of Water Resources Management and Agro-meteorology, in particular fulfillment of the requirements for the award of bachelor in water resources management and agro-meteorology degree of the Federal University Oye-Ekiti, Ekiti State, Nigeria.

  
Professor. Ayorinde A. Olufayo

Supervisor

Date:

  
Professor. Ayorinde A. Olufayo

Head of Department:

Date:

## DEDICATION

This piece of work is dedicated to the almighty God for seeing me through the course of my study. It's also dedicated to my parents, siblings and family for supporting me through this project study.

## ACKNOWLEDGEMENT

I am grateful to God almighty for the grace, strength, knowledge and wisdom granted to me in undertaking this research. I would like to express my sincerest gratitude to my supervisor Prof. Ayorinde A. Olufayo for his advice, thoughtful suggestions and understanding. His intellectual inspirations and encouragement were very helpful in my whole period of research.

I am grateful to my parents Alhaji Deji Aiyelabowo and Deaconess Modupe Aiyelabowo and my siblings for their financial, moral and spiritual support.

I appreciate the Head of department, Prof Ayorinde A. Olufayo and all the lectures in the department, Prof E.A Olofin, Prof A.Y Sangodoyin, Prof. P.G Oguntunde, Dr. A.G Omonijo, Mrs T. Babalola, Mrs B. Adabembe, Mr D. Adeyemo and Mr I. Achubu

My appreciation also goes to all the non-academic staff of the department of the water resources management and agro-meteorology for all the support, encouragement and constructive criticisms which have made this research a success

My gratitude also goes to my course mates who were with me through the thick and thin and for the challenges and encouragements.

God bless you all in Jesus name.

## TABLE OF CONTENTS

CERTIFICATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT.....	iv
TABLE OF CONTENT.....	v
LIST OF FIGURES.....	viii
LIST OF TABLES.....	ix
ABSTRACT.....	x
CHAPTER ONE.....	1
INTRODUCTION.....	1
1.1 BACKGROUND.....	1
1.2 AIM OF THE PROJECT.....	2
1.3 OBJECTIVES.....	2
1.4 SCOPE OF THE STUDY.....	3
1.5 RESEARCH QUESTIONS.....	3
1.6 RESEARCH STUDY OUTCOME.....	3
CHAPTER TWO.....	
4 LITERATURE REVIEW.....	4
2.1 MEDICAL WASTES.....	4
2.2 TYPES OF MEDICAL WASTES.....	5
2.3 METHOD OF MANAGING MEDICAL WASTE.....	6
2.4 PROCESS OF MANAGING MEDICAL WASTE.....	8
2.4.1 PLANNING.....	8
2.4.2 MINIMIZATION.....	9
2.4.3 SEGREGATION.....	9
2.4.4 PACKAGING AND LABELING.....	10
2.4.5 TRANSPORTATION.....	10

2.4.6 TREATMENT.....	11
2.5 SURVEY OF RELATED WORKS.....	11
CHAPTER 3.....	14
RESEARCH METHODOLOGY.....	14
3.1 DESCRIPTION OF STUDY AREA.....	14
3.2 METHODOLOGICAL TECHNIQUE.....	16
3.3 FIELD WORK.....	17
3.4 MEDICAL WASTE DISPOSAL SITE OBSERVATION.....	17
3.5 MATERIALS.....	18
3.6 SURVEY QUESTIONNAIRE FOR MEDICAL WASTE DIPOSAL SYSTEM IN EKITI STATE SPECIALIST HOSPITALS.....	19
3.7 ENVIRONMENTAL EFFECTS OF POOR MEDICAL WASTE DISPOSAL.....	21
3.8 MEDICAL WASTE CLASIFICATION.....	22
CHAPTER 4.....	24
RESULT AND DISCUSSION.....	24
4.1 RESULT.....	24
4.2 DISCUSSION.....	26
4.2.1 WASTE TREATMENT AND DISPOSAL.....	27
4.3 BASIC PROBLEM OF MEDICAL WASTE MANAGEMENT IN ADO EKITI.....	28
4.4 GNAAT CHAT.....	31
CHAPTER 5.....	33
CONCLUSION AND RECOMMENDATION.....	33
CONCLUSION.....	33

5.2 RECOMMENDATIONS.....	34
5.3 CONTRIBUTIONS TO KNOWLEDGE.....	35
5.4 LIMITATION.....	35
REFERENCE.....	36

## ABSTRACT

The study investigated the disposal of medical wastes in health institutions in Ekiti State, Nigeria. It involves visitation, survey work which entails administration of questionnaire and library study to gather information which includes type of waste, volume of waste generated and the disposal system adopted by the health institution. The project involved the visitation of clinics, private and public hospitals in various local government in Ekiti State. The types of medical wastes examined in the course of this study includes regulated wastes, infectious wastes, sharps, chemicals and some other medical wastes. The disposal system adopted by most clinics were road side refuse dumps while most private hospital adopt burning method of disposal and most public hospital adopt the use of waste management bins. It was concluded that medical waste disposal in Ekiti State is inadequate and can be improved by enforcement of use of waste management bins in all health institutions in all local government of the state



## CHAPTER ONE

### INTRODUCTION

#### 1.1 BACKGROUND

Medical waste management and disposal is a major problem in most developing countries of the world due to poor management. In the case in Ekiti State and other states in Nigeria, there exist an imbalance between the production of medical waste and efficient waste disposal. This is because clear priority has often been given to issues of industrial and commercial development without paying attention to waste disposal facilities. This has resulted to waste been piled up along street sides and at times totally blocking the driveway. This in turn puts the health of the populace at a great risk (Olufisayo, Solid Waste Management in Ado municipality, South-Western Nigeria, 2014). The treatment and disposal of medical waste from hospitals, clinics and health institutes has been a great concern in recent times. This is as a result of hazardous nature of these wastes and the potential threat to spread deadly diseases to humans and other living organisms. Medical care is very important for our life, health and well-being but the waste extracted from medical practice can be harmful, poisonous and even deadly because of their high potential for diseases transmission. The concern for hospital waste management was increase in infectious diseases and indiscriminate disposal of waste in worldwide. Medical waste has been identified by the US Environmental Agency as the 3<sup>rd</sup> largest known source of dioxin air emission and contributor of about 10% of mercury emissions to the environment from human activities. In this last few decades, the generation of biomedical waste has increased; management of medical waste continues to be a major challenge. Biomedical waste is generally extracted from hospitals, health care teaching institutes, research institutions, blood banks, clinics, laboratories, veterinary institutes and animal houses etc. (Irin, An analytical study on medical waste management in selected

hospitals located in Chennai city., 2018). In developing countries such as Nigeria, the international policy that the generator of waste is responsible for the proper management, treatment and disposal of waste has remained on paper and is yet to be implemented. The notion that waste is the responsibility of the government authorities has not enabled waste generators to appreciate the negative impact of improper waste disposal. (Adegoke A.A, 1989) Although waste is generated from anywhere such as homes, offices, industries, agriculture, schools, living things and healthcare establishments, more concern is given to healthcare wastes due to its hazardous nature and disease transmission characteristics of some of the wastes (Ngwuluka Ndidi1\* O. N., 2009). Healthcare establishments generate wastes, by products of health care which can be classified into infectious and non-infectious wastes. (Patil and Shekdar, 2001). Hazardous wastes are classified into infectious, pharmaceutical, pathological, genotoxic, sharps, chemical, radioactive and those with high heavy metal contents. A hazardous waste is one which may be toxic, genotoxic, corrosive, flammable, reactive, explosive, radioactive, containing infectious agents. (Pruss et al, 1999).

## **1.2 AIM OF THE PROJECT**

The aim of this research work is to investigate the methods of medical waste disposal systems in hospitals, clinics and health centres in Ekiti State.

## **1.3 OBJECTIVES**

The specific objectives of the research works are to:

- i. Characterize types of medical wastes generated in the hospitals, clinics and health centres.
- ii. Evaluate the methods of waste disposal adopted by the institutions.

- iii. Propose or suggest an improvements in the medical waste disposal methods used in health institutions in Ekiti State.

#### **1.4 SCOPE OF THE STUDY**

This research work focuses on health institutions (hospital, clinics and health centres) in all local governments in Ekiti State. It involves visitation, survey work, administration of structured questionnaire and library study to elicit and gather vital information such as type of waste, volume of waste generated and the disposal system adopted by the health institution.

#### **1.5 RESEARCH QUESTIONS**

The research questions are:

- i. What are the characteristics of the medical waste generated?
- ii. How can medical waste be managed more efficiently?
- iii. In what way can the disposal of medical wastes be improved in Ekiti state?

#### **1.6 RESEARCH STUDY OUTLINE**

This project is divided into five chapters as follows: chapter one entails the introduction, scope, background, aims and objectives while chapter two explains the literature review and theoretical background of implementing the research topic and chapter three shows the research methodology. The chapter four explains the result and discussion with gnat chart while the chapter five concludes the research with its limitations and recommendations

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 MEDICAL WASTES

Medical Waste generated in hospitals and health-care centres is large in quantities. When someone goes to the hospital to get a blood test, it creates waste from the needle, its packaging, tape and possible disinfection items. Waste generated in the health-care area is not only our everyday waste, but also the special and hazardous waste, which causes a risk throughout the waste management process. This is why hospitals in developed country are constantly reminded to take care of their waste management processes, to ensure their safe handling, transportation and landfill, as well as proper marking of hazardous waste. The work done in hospitals and health-care centres is important to our life and health, but the waste created to make mankind healthier represents a real problem for nature and humans alike. It is a known fact that improper management of waste generated in hospitals causes direct health impacts on the community. (WHO 2015). Medical waste are hazardous substances and include pathological waste (e.g., body parts removed during surgery), infectious materials (e.g., tumours and fibroid), sharps (e.g., needles and broken glass objects), and chemical waste such as spilled disinfectants. However, all medical wastes do not come from obvious point sources such as hospitals, doctors' offices, clinical laboratories, and research facilities because more than a million syringes are used at home by diabetics and other out patients on a daily basis. Similarly, post-operative patients are more frequently discharged to their homes with surgical dressings and other potentially contaminated medical paraphernalia which constitute medical wastes. Even though some of the waste created in hospital section is not considered to be hazardous, they are still treated as such, and the waste amount created from this is approximately five percent of the total waste amount (Melanen, 2016)

## 2.2 TYPES OF MEDICAL WASTE

The different types of medical waste can be distributed into several different categories, as the waste diverse from a range of materials. The listings of waste are according to the World Health Organization, and the percentages mentioned here are an approximate value. (WHO 2011). There is a listing on medical waste created in hospitals that is covered on the site of World Health Organization. (WHO 2011). Key facts about the waste generated from health-care activities give a small image for people to think about, when talking about medical waste. The health-care/hospital section generates a lot of waste, of which 80% is considered as general waste.

- i. **Infectious waste:** waste contaminated with blood and it's by products, cultures and stocks of infectious agents, waste from patients in isolation wards, discarded diagnostic samples containing blood and body fluids and contaminated materials, such as swabs and bandages and equipment used for medical operations.
- ii. **Pathological waste:** recognizable body parts.
- iii. **Pharmaceuticals:** expired, unused and contaminated drugs, vaccines and sera.
- iv. **Genotoxic waste:** highly hazardous, mutagenic, teratogenic (capable of producing fatal malformation), or carcinogenic, such as cytotoxic drugs used in cancer treatment and their metabolites.
- v. **Heavy metals waste:** such as broken mercury thermometers.
- vi. **Chemical waste:** This comprises discarded solid, liquid and gaseous chemicals e.g. cleaning, housekeeping, and disinfecting product.
- vii. **Radioactive waste:** It includes solid, liquid, and gaseous waste that is contaminated with radionuclide's generated from in-vitro analysis of body tissues and fluid, in-vivo body organ imaging and tumour localization and therapeutic procedures

**Viii.Biomedical waste:** Any solid, fluid and liquid or liquid waste, including its container and any intermediate product, which is generated during the diagnosis, treatment or immunisation of human being or animals, in research pertaining thereto, or in the production or testing of biological and the animal waste from slaughter houses or any other similar establishment. All biomedical waste is hazardous. In hospital it comprises of 15% of total hospital waste

The approximate percentages on the waste categories are as follow: 15 % for infectious and anatomic waste. 1% for sharps, but sharps being the major source of disease transmission. 3% for chemicals and pharmaceuticals, and 1% for radioactive matter and heavy metal content. It should be noted that the medicinal waste mentioned here are gathered from several different sources, while the main focus of this research is on hospital wastes.

## **2.3 METHODS OF MANAGING MEDICAL WASTE**

The four common methods of managing waste are land filing, incineration, composting and anaerobic digestion. Incineration, composting and anaerobic digestion are volume reducing technologies. Ultimately, residue from these methods must be land filled. (Awosusi, 2010).

### **i. Open Dumps**

Open dumping occurs when large quantities or piles of waste are deposited in areas, not designed to handle such materials. Improper disposal of waste is not only unsightly; it may affect the public health and the environment. (Awosusi, 2010).



Figure 1. Open dump in Ado Ekiti

#### **ii. Land Filling**

A sanitary landfill is a site for the disposal of waste materials by burial and is the oldest form of waste management. Land filling involves pitching refuse into a depression or closed mining sites. (Awosusi, 2010).

#### **iii. Composting**

Waste decomposes in an enclosed chamber due to activities of bacteria, using the oxygen that combined chemically with waste. Composting is a process of biological decomposition of waste under aerobic and haemophilic conditions, which breakdown organic materials leaving a humus rich residue (Awosusi, 2010).

#### **iv. Incineration**

Incineration is a process of destroying waste material by burning. It is the most practical method of disposing hazardous waste. Incineration is the high temperature, combustion of solid waste after separating the non-combustible. On-site incineration of hospital wastes - a common practice that effectively destroys infective organisms - is of increasing concern as a source of dioxins due to the high chlorine content of many of the disposal plastics in common medical use. (Awosusi, 2010).



Figure 2 Single chamber incinerator at Ekiti State Waste Management Board

## **2.4 PROCESS OF MANAGING MEDICAL WASTE**

### **2.4.1 PLANING**

Every sound management scheme starts with a solid plan. At this stage, hospitals will lay out their waste management strategy, as well as their roles and responsibilities of each member. Typically, this includes the creation of a waste management committee and the designation of a waste management officer who oversees the day-to-day handling and monitoring of waste.



It is equally important for the hospital to know how much and what types of waste is generates, and to what degree it fluctuate. (Adedibu A.A, 1988)

#### **2.4.2 MINIMISATION**

The worst way to deal with waste items is to dispose of them. That is, the most effective waste management solution is to not produce waste in the first place. This is an impossible standard, and in case where waste is unavoidable, hospitals should consider waste minimisation through the reuse of material as long as patient safety is not compromised. To this end, hospitals should also be smarter with their procurement, opting instead for greener alternatives, such as non-mercury thermometers and recyclable plastic containers. (Clark, RM 2002).

#### **2.4.3 SEGREGATION**

The collected medical waste from medical centres, infectious, pathological waste and sharps will be placed in different containers and labelled biohazard, uniform colour for each type of medical waste. The size of the containers depends on the volume of waste generated in the centre. The segregation process reduces the toxicity and the volume of the waste, it makes easier to transport the waste. Segregation process depends on the quantity, composition and the disposal. Wastes should be segregated at the point of generation before treatment and disposal to protect both humans and the environment. Segregation of wastes would result in a clean solid waste stream which could be easily, safely and cost effectively managed through recycling, composting and land filling (NIHE, 2006). The different categories of healthcare hazardous waste should be segregated, collected in different and suitable containers, appropriately stored where required and the appropriate, clean and safe treatment and disposal options used. (Adedibu A.A, 1988)

#### 2.4.4 PACKAGING AND LABELING

Packaging the medical waste in uniform colour code bags and labelling the waste and store then in the common storage point ( Sutha Irin, 2018).

#### 2.4.5 TRANSPORTATION

The medical waste will have transported from the common storage point to common Bio-Medical waste treatment facility storage point. ( Sutha Irin, 2018).

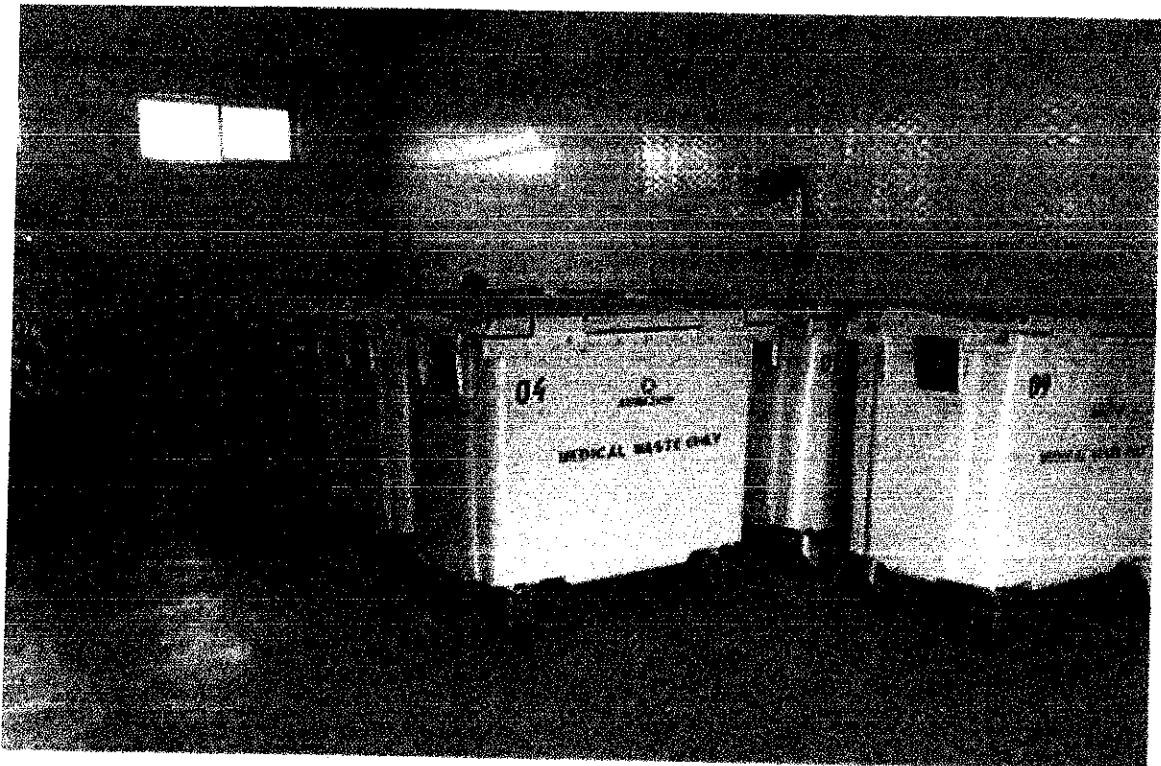


Figure 3 special containers for loading medical waste at a transfer loading station

(Source: Google)

#### **2.4.6. TREATMENT**

The process of incineration will destruct the waste by burning it at elevated temperature, which will remove the hazardous, reduce the value of the waste and convert to ash.

Incineration process suits for pathological and sharp wastes. Auto calving process will kill bacteria and infectious material in the biomedical waste, it will be considered as non-infectious and go for landfill. The shredding machine is used to destroy waste such as syringes, scalpels, vials, glass, plastics, blades etc., it will shape or cut waste into small pieces, so that waste unrecognizable and safe to disposal recycling and landfill. Open burning should be carried out at temperatures below the recommended temperature of 1000°C. Since there was no segregation, pharmaceutical and cytotoxic wastes that should not be burnt at temperatures below 1000°C, were being burnt together with the subsequent release of toxic emissions into the air. Such toxic emissions may include dioxins, furans and heavy metals emitted as fumes or vapours. (Lee et al., 2004; Lee and Huffman, 1996). However, the benefits of incineration include reduced volume of waste, the unrecognizable end product in form of ash and destruction of pathogens. (Lee and Huffman 1996). Burning of pharmaceuticals and cytotoxic drugs should be done in well-constructed incinerators at recommended temperatures with facilities to control emissions. For cytotoxic drugs and large pharmaceuticals, rotary kilns designed for industrial waste and operated at temperatures greater than 1200°C should be used. (Pruss et al, 1999).

#### **2.5 SURVEY OF RELATED WORK**

i. A research was carried out on solid waste management in Ilorin, Kwara State. This project is on solid waste management in Ilorin and it studies the sources, types of wastes and various ways in which wastes are managed in Ilorin using various research tools. The research

reveals that wastes could be a source of wealth if managed effectively but could also cause serious health and environmental problems if not effectively managed. The study reveals the set back and factors militating against proper waste management in Ilorin and possible means of correcting them. The method employed in this research was divided into the following: An intensive literature review, Questionnaire survey, Physical observation of Kwara State Waste Management Board (KSWMB) and Kwara State specialist hospital. During the course of the study libraries were consulted to search for relevant literature on the subject matter, textbooks, journals were consulted to obtain information on the subject matter. Points raised in all the textbooks, journals were made use of it in the research. The distribution of questionnaire was carried out to obtain relevant information on the study, information and data obtained include the following collection bin, method of disposal, frequency of collection, method of disposal waste, average attitude of people towards indiscriminate disposal refuse, period in which waste are mostly generated and some other information. A total of 500 questionnaires were distributed also during the course of the study, the researcher visited various places in the town, especially the resident areas, commercial centres and some industrial places. One important place also visited was Kwara State recycling and treatment plant and their activities were being discussed in the literature review. Observation were also made on waste generation storage facilities, collection and disposal system. The researcher also visited the waste management board and was able to get adequate information and data on expected volume of waste that can be generated daily by an individual composition of waste was also obtained. During the researchers visit to the state hospital, a comprehensive detail on diseases associated with wastes was obtained. He encountered some problems during the course of study one of which was the un-operating attitude of some respondent to provide answers to some questions (Olufisayo, 2014).

ii. This researcher surveyed a medical waste management practice and their implications to health and environment was carried out in metropolitan Lagos. The research designed employed involves the use of survey and also interviews with offices in charge of medical waste management. In each hospital, a simple and objective questionnaire based on the guidelines of the safe management of waste from health care facilities was administered in each hospital. Health care managers, nurses, nursing assistant and waste handlers within and outside the hospitals were among those interviewed. The questionnaire contains information on waste generation and main aspect of segregation collection, storage transportation, treatment and final disposal of medical waste. Information gathered was used to analyse profile of the management programme adopted by the hospitals for their medical waste. Site visited were helpful to obtain primary information data on common practices of medical waste management. The generation rate of medical waste in kg/bed/day in each hospitals was evaluated. (Olufisayo, 2014).

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.1 DESCRIPTION OF STUDY AREA

Ado Ekiti is a city in the south west of Nigeria and the state capital of Ekiti State with population of 308,621 as at 2006 census covering an area of 293 km square, its coordinates are longitude 5° 37' 16"N 5° 13' 17"E with an average growth of about five percent..

Geologically, Ado-Ekiti lies entirely within the pre-cambrian basement complex rock group, which underlies much of Nigeria. It falls within koppen's 'a' climatic belt that is tropical wet climate. The city is strategically located in Ekiti land at the convergence of major roads forming a radial pattern. These roads are Ado Ekiti- Akure road passing through Ikere, Ilesha-Aramoko-Iyin-Ado-Ekiti road, Ogotun-Igbaraodo-Ilawe-Ado Ekiti, .Ikare-Aisegba- Ijan-Ado-Ekiti road.

In this study, hospital visited were:

- i. Ekiti State Teaching Hospital, Ado Ekiti
- ii. Life spring hospital, Ado Ekiti
- iii. Hope specialist hospital, Ado Ekiti
- iv. Ade-Tade hospital, Ado Ekiti
- v. Trinity hospital, Ado Ekiti
- vi. Afolabi specialist hospital, Ado Ekiti
- vii. St. Gregory hospital, Ado Ekiti
- viii. Maria assumpta hospital, Ado Ekiti
- ix. Akintade specialist hospital, Ikere Ekiti
- x. Christ the king clinic, Iworoko
- xi. St luke specialist hospital, Ikere Ekiti

xii. General hospital, Ikole Ekiti

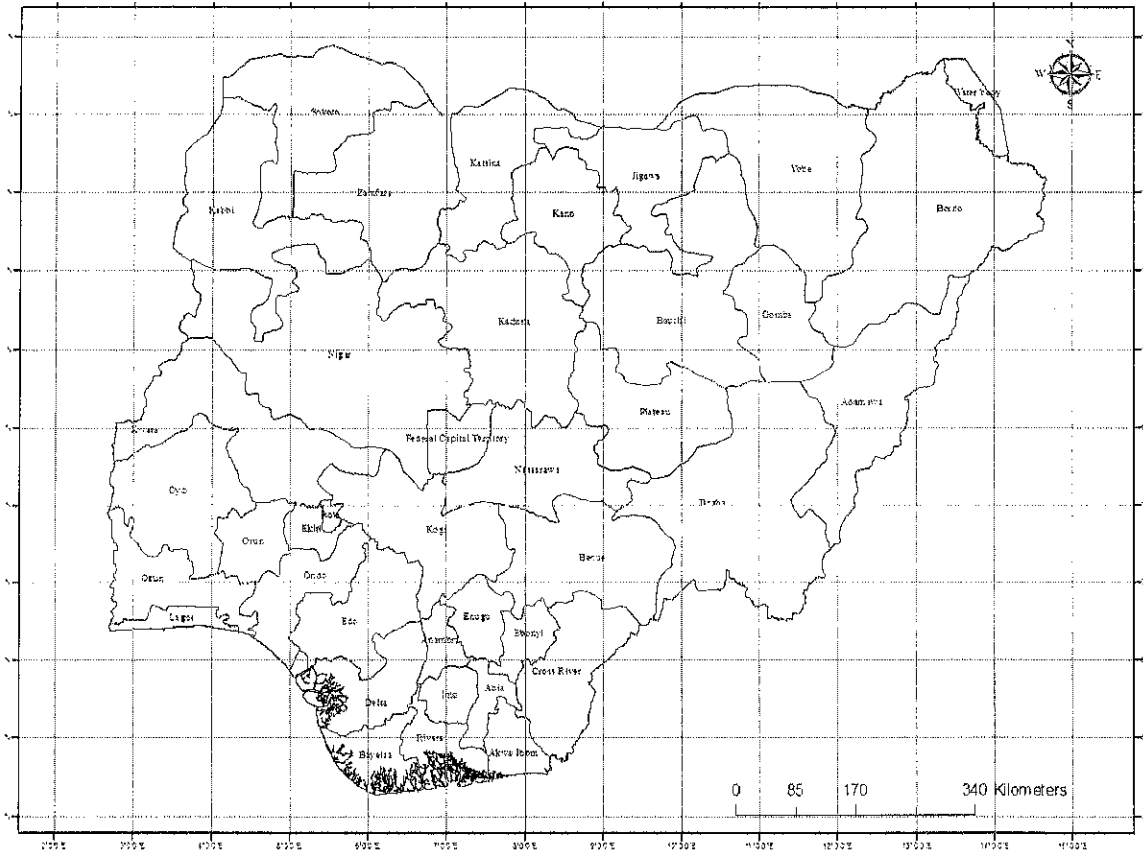
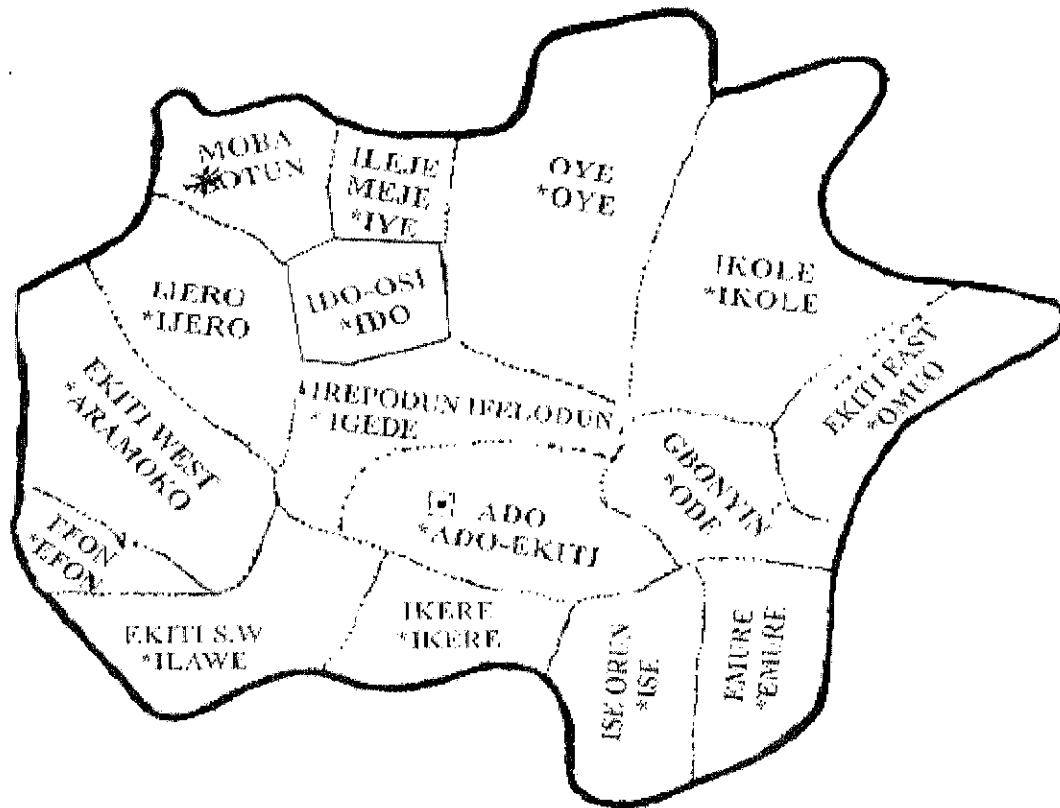


Figure 4. Map of Nigeria showing Ekiti State



**MAP OF EKITI STATE**

Figure 5. Map of Ekiti State.

### 3.2 METHODOLOGICAL TECHNIQUE

The case study for this research focuses on Medical waste disposal in Ado Ekiti and data was obtained for the study through a combination of questionnaire and interviews. Ado Ekiti was chosen as a case study in this research because it is the state capital with more populations and the city appears to be having a serious medical waste management problem, a study towards improving the management of waste collected from hospitals in the city may serve as a driver for improvement of the same in other states in the country. Finally, while many study have focused on the challenges of solid waste disposal in some states of the country. This research takes an approach in its study to medical waste disposal in Ado Ekiti. The type of



medical waste generated by hospitals, the disposals of this waste and every other thing surrounding medical waste handling and management.

### **3.3 FIELD WORK**

The method employed in this research field work includes

- i. An intensive literature review i.e. going through previous works that have been done in regard the research topic
- ii. Questionnaire survey elicit relevant information
- iii. Physical observation
- iv. Visit to Ekiti state waste management board
- v. Interview session with medical officers across the hospital used as a case study

### **3.4 MEDICAL WASTE DISPOSAL SITE OBESERVATION**

During the course of the study, I visited the different hospitals highlighted and also the Ekiti State Ministry of Health to collect information on numbers of health institutes in the state and their location. Other information which include size of the institute, location on map, and type of waste generated, volume of waste generated and other statistics. Observation were also made on waste generation storage facilities, collection and disposal system. I also visited the Ekiti State Waste Management Board and I was able to get adequate information and data on expected volume of waste that can be generated daily. The observation also included a survey and gathering of information with some operational staffs in the hospitals.



Figure 6. Improper storage of both general waste and infectious waste at St Gregory Hospital  
at Ado Ekiti

### 3.5 MATERIALS

Materials used for collecting data from the field includes a tape recorders for the interview ; this is essentially a useful tools for qualitative interviews as it helps in the research with the ability to give full attention to the subject response, asking further questions on points of interest in the response, while also identifying inconsistency if any. The same was used during observation on medical waste disposal site in addition in addition to the use of camera, for hospital observation, a pair of gloves, though the utilization of camera was for the purpose of photograph. (Bryman, 2004)

**3.6 SURVEY QUESTIONNAIRE FOR MEDICAL WASTE DISPOSAL SYSTEM IN  
EKITI STATE SPECIALIST HOSPITALS**

**Hospital Name:** Ekiti State Specialist Hospital

**Location:** Ado Ekiti

**Researcher:** Aiyelabowo Olawale

**Research purpose:** Requirement for a Bachelor's degree in water resources

**Tick appropriately**

**DESIGNATION:**

Doctor  Nurse  Cleaner  Lab technician

1. Are there medical waste collector in Ekiti State?

Yes,  No  Not sure

2. What agency(ies) regulate(s) wastes generated in this Hospital?

State  Private  Do not know

3. Do you think it is necessary to carry out a research on medical waste disposal?

Yes,  No  Do Not Know

4. Biomedical Waste (Management & Handling) Rules were first proposed in:

1997  1998  1999  2000

5. Which statement defines Medical waste:

Materials that may be poisonous, toxic, or flammable and do not pose disease-related risk.

Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood.

Waste that does not pose a disease-related risk.

6. According to the Biomedical Waste (Management & Handling) Rules, waste should not be stored beyond:  12 hours  48 hours  72 hours  96 hours

7. Is the waste disposal practice correct in your hospital?

Yes  No  Cannot comment

8. Objects that may be capable of causing punctures or cuts, that may have been exposed to blood or body fluids including scalpels, needles, glass ampoules, test tubes and slides, are considered biomedical waste. How should these objects be disposed of?

Black bags  Yellow bags  Clear bags  Sharps container

9. Documents with confidential patient information are to be disposed of into the paper recycling bins.

True  False  Do not know

10. All of the following statements about hazardous waste containers are true, except for:

Containers must be closed except when removing or adding waste.

Containers must be clean on the outside.

Contents must be compatible with the type of waste containers.

Any type of container, including food containers, can be used to contain hazardous waste.

11. Will you like to attend voluntarily programmes that enhance and upgrade your knowledge about waste management?

Yes  No  Cannot comment

12. Do you think that infectious waste should be sterilised from infections by autoclaving before shredding and disposal?

Yes  No  Cannot comment

13. Do you think it is important to report to the Pollution Control Board of Ekiti about a particular institution if it is not complying with the guidelines for medical waste disposal?

Yes  No  Cannot comment

14. Do you think that labelling the container before filling it with waste is of any clinical significance?

Yes,  No  Cannot comment

15. Is needle-stick injury a concern?

Yes  No  Do not know

### **Theoretical Question to Be Answered by A Medical Doctor**

1. How can the disposal of Medical waste be improved on in Ekiti State.
2. What type of waste is generated here in your hospitals and the volume of waste generated by the hospital per day/week?

### **3.7 ENVIRONMENTAL EFFECTS OF POOR MEDICAL WASTE DISPOSAL**

- i. Health Effects: inadequate, improper sanitation and poor medical waste disposal can result to the transmitter of diseases in the world developing country. People living close to dumpsite usually have health problems. (Olanipekun J.A. Oyeniyi P. and Konwea P.E)
- ii. Flooding: Some medical waste if discharged into drainage system may block the free flow of water which may eventually result to flooding. (Olanipekun J.A. Oyeniyi P. and Konwea P.E)
- iii. Effects on aquatic system: Medical waste if discharged into water body (streams, rivers and lakes), may affect the water quality such that the purpose of the water body maybe interfered with. And this might make some water not palatable for drinking and may have effect on the fish inside the water.



Figure 7. Waste scattered near a stream in Iworoko Ekiti

### 3.8 MEDICAL WASTE CLASIFICATION

Table 3.1: Medical waste classification

CONTAMINATED WASTE	DESCRIPTION
Regulated/domestic waste	Food remains, used toiletries, food containers and used office papers
Waste from surgery	Surgical gloves, lavage tubes, under pads, drainage sets and sponges
Waste from sharp objects	Disposal needles, syringes and broken glasses
Pharmaceutical waste	Expired drugs and chemicals
Dialysis unit waste	Tubbing, towels, glove, apron and lab coat
Contaminated equipment	Equipment used in patient care and medical laboratory

Radioactive medical waste	Solid, liquid and gaseous waste contaminated with radioactive substances used in diagnosis.
---------------------------	---

## CHAPTER FOUR

### RESULT AND DISCUSION

#### 4.1 RESULT

The results of the administered questionnaires after being drawn from the various hospitals have been summarized in the table below:

**Table 4.1.**

Questionnaire	Number	Percentage
Number Returned	66	82.5
Number Not Returned	14	17.5
Total	80	100

**Table 4.2 Composed medical waste from hospitals in percentage**

Waste Category	Private Hospital 1	Private Hospital 2	Clinic 1	Public Hospital 1	Public Hospital 2	State teaching hospital
Regulated waste	62	50	68	54	70	65
Infectious waste	28	30	20	30	18	25
Sharps	10	10	10	10	11	8
Chemical	6	7	1	4	1	1
Others	2	3	1	2	Nil	Nil
Total	100	100	100	100	100	100



- i. Private hospital 1: Life spring hospital, , Hope specialist hospital, Ade-Tade hospital and Trinity hospital
- ii. Private hospital 2: Afolabi specialist hospital, St. Gregory hospital, Maria assumpta hospital and Akintade specialist hospital
- iii. Clinic 1: Christ the king clinic
- iv. Public hospital 1: St luke specialist hospital, Ikere Ekiti
- v. Public hospital 2: General hospital, Ikole Ekiti
- vi. State teaching dhospital: Ekiti State Teaching Hospital, Ado Ekiti

**Table 4.3 Medical waste generated in the hospital surveyed**

S/N	HOSPITAL TYPE	NO OF BEDS	WASTE GENERATED Kg/day	GENERATION RATE Kg/bed/day
1	Private	20	11.25	0.2815
2	Private	25	14.05	0.281
3	Clinic	15	7.625	0.265
4	Public	150	80.65	0.2135
5	Public	300	150.3	0.333
6	Teaching	800	489.7	0.786

**Table 4.4 Method of medical waste disposal**

METHOD	HOSPITAL FOLLOWING SUCH
Road side/nearby refuse dump	Clinic 1
Burning	Private 1 and Public 2
Waste management bin	Ekiti teaching Hospital, Public 1 and Private 2
Dumping at streams	Nil

**Table 4.5. Attitude of people towards indiscriminate disposal**

Attitude of people	Number	Percentage
Feel concerned	54	67.5
Feel less concern	20	25.0
Indifferent	6	7.5

## **4.2 DISCUSSION**

The results on how interviewers responded within the study area dispose medical waste revealed that few percentage dump waste in bushes, some use waste bins, while some dump refuse in gutters/streams. This implies that some of the hospitals in the study area dispose their medical waste unlawfully, a habit which results into health hazards in the area. Also I was made to know how often waste management personnel come to evacuate refuse in the area as this is done once in a week and for some areas once a month depending on their commitment in cash to the waste management board. The implication of this is that untimely evacuation of waste in the study area could be partly responsible for health hazards in the area. The results on how medical waste disposal sites are managed by waste management personnel showed that some observed burning of solid waste materials, some by burial, while

some noted abandoned medical waste site. This suggested that the waste management personnel were doing their best to ensure that the environment is free from health hazards. The results on how the public could be involved in waste management showed that some of the respondents stated payment for service, few reported general environmental sanitation, chose voluntary donation of tippers/lorries for use, and others stated individual cleaning of Surroundings by the hospital management and proper disposal, while very few noted environmental awareness of the danger of improper medical waste disposal. This reflected that majority of the people solely depended on the monthly general environmental sanitation to tidy their surroundings. The findings on the problems of solid waste management agency in the study area showed that there is shortage of vehicles, shortage of waste containers, shortage of personnel, poor funding/encouragement by Government, lack of dedication to duty. It is suggested that there is need to increase/improve on the level of facilities and human resources in the Waste Management Board, to ensure their success in their fight against health hazards from medical waste materials in the hospitals. (Olanipekun J.A. Oyeniyi P. and Konwea P.E.2007)

#### **4.2.1 WASTE TREATMENT AND DISPOSAL**

Burning and burial of medical waste are practiced, sadly enough medical waste, infectious waste is not excluded from this act of practice. A common act is the disposal of infectious and regulated waste types either on land within the hospital premises or in streams. The observed poor medical waste management practice is a risk to public health especially when most hospitals are surrounded by density populated committee. As earlier on indicated the public hospitals are equipped with incriminators with only one being functional. Infectious medical waste and sharps are incriminated in house by the hospital engineering department. To its credit it is only hospital that engages the service of an environmental officer to oversee

the treatment and eventual disposal of its medical waste. Most of the hospital employ the service of private waste collectors for medical waste collection and final disposal at government authorised dumps, notable among this private collector is the state owned waste management authority that specialized in the collection of industrial waste from most industrial set ups within the city. Two major observed challenges to the environment are open dumping either within the hospital premises or at government recognized dumping site, and non-treatment of infectious waste before final disposal. Open dumps are known to have no controls over access of unauthorized person or environmental pollution, hence, the potential health risk. (WHO, 1999). The determination and the use of environmentally safe and technologically sound techniques for disposal of toxic, hazardous and radioactive waste. The various dumpsites within the hospital vicinity do not meet necessary design criteria to operate as landfills for hazardous waste. In conclusion treatment and disposal of medical and infectious waste and sharps needs adequate legal backing in case of noncompliance by. (Longe E.O, 2006).

#### **4.3 BASIC PROBLEM OF MEDICAL WASTE MANAGEMENT IN ADO EKITI**

- i. High Volume of Refuse:** The volume of waste been generated in Ado is relatively high and problematic with the recent development, more people are now moving into the city, this increase in the gradual increase in population figures from 1996 to 2011 as a result more waste in generated without equivalent improvement management strategies. (Oreyomi M.K, 2005)
  
- ii. Financial Problems:** Financial is a major problem in the management of medical wastes because funds are usually delayed and most of the equipment's require fuel to power them and also their maintenance cost is high. (Oreyomi M.K, 2005)

**iii. Indiscriminate Dumping:** Indiscriminate dumping of refuse by people is another problem, In Ado where rudimentary drains exist, there are usually opened and clogged up with polythene or pure water. These waste causes flooding in rainy season due to a blockage of the major drainage channels. (Oreyomi M.K, 2005)

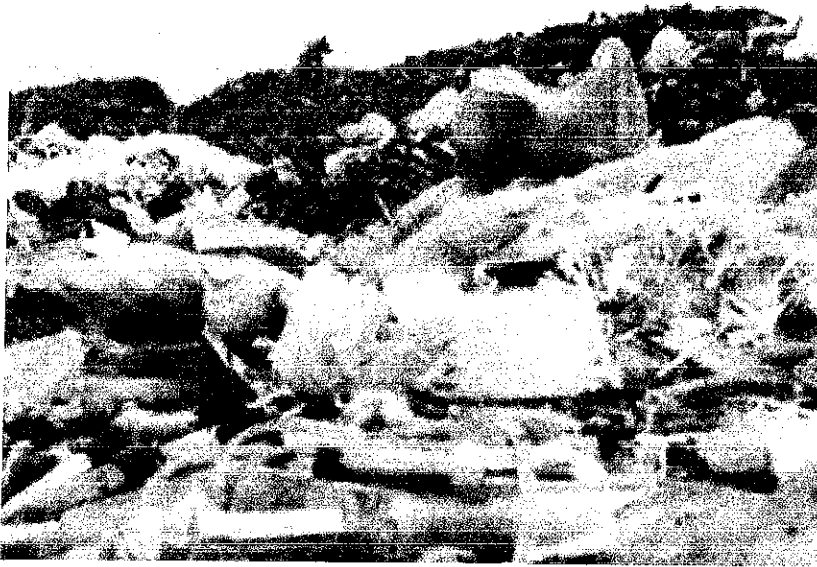


Figure 8. Waste disposal at Christ the King clinic, Iworoko Ekiti



Figure 9. Waste disposal at Christ the King clinic, Iworoko Ekiti



Figure 10. Waste room at a developed country Hospital (source: Google)

**iv. Inadequate Refuse Vans:** Due to the growing population, the refuse van in the state makes it difficult to meet with the demand of waste disposal leading to a delay in waste collection. (Oreyomi M.K, 2005)

**v. Lack of waste data:** Waste generation, collection and characterization is generally poor or in some cases not available. (Oreyomi M.K, 2005)

#### 4.4 GANNT CHAT

	WE EK 1	WE EK 2	WE EK 3	W EE K 4	WE EK 5	WE EK 6	WE EK 7	WE EK 8	WE EK 9	WE EK 10	WE EK 11	WE EK 12	WE EK 13	WE EK 14	WE EK 15	WE EK 16	WE EK 17	
TASK 1	█																	
TASK 2																		
TASK 3										█								
TASK 4													█					
TASK 5														█				
TASK 6																█		
TASK 7																	█	

**Task 1- Gathering of journals for project research.**

**Task 2- Visit to hospitals within Ekiti.**

**Task 3- Interviews with medical staffs.**

**Task 4- Questionnaire distribution.**

**Task 5- Project write up**

**Task 6- Review of project work for correction**

**Task 7- project print out and binding.**

The breakdown in the chat above describe the sequential activities carried out to the achievement of this project research. The span for the project was approximated to seventeen weeks, the structure did not follow each other in a successive manner but each allotted time

took into consideration all factors required in executing the task including the likely problems to occur and subsequent measures were put in place to tackle the problems



## CHAPTER FIVE

### CONCLUSION AND RECOMMENDATIONS

#### 4.1 CONCLUSION

Despite the challenges associated with medical waste especially the lack of policies and regulations as stipulated by WHO, Ekiti state has taken the initiatives to have a well-organized system of collecting and treating waste. The State has also taken further steps by providing the needed items like the different colored containers, liners to the hospitals at no cost. Waste management board also collects the waste for final disposal at little cost so that the hospitals can be encouraged to segregate and collect their waste appropriately. From the findings of this study, it suffices to conclude that there is little progress in the management of medical waste in Ekiti State because of the following: The medical waste disposal practices among the various hospitals surveyed are similar except for the private hospital which still mixes its medical and general waste. The medical waste is collected and segregated using the three colours coding system by WHO, then transfer to the on-site storage and finally transported by Ekiti State to the transfer loading station where it is treated. This system is congruence with WHO specifications however; uniformity in MWM practices should be ensured in all hospitals as against the divergent of hospital. It can be concluded from the present study that there is poor level of knowledge and awareness about medical waste disposal in some particular hospital in Ekiti state. A subsequent literature review suggests that this is a common problem in many other health care institutions in both Ekiti state and other state of Nigeria. It is imperative that waste should be segregated and disposed of in a safe manner to protect the environment as well as human health. Regular monitoring and training are required at all levels. (Melanen, 2016).

## 5.2 RECOMMENDATIONS

Based on the findings in this research work, it has become imperative to put up some recommendation that are necessary to improve the living condition of the urban residents, their environment together with their health condition.

- i. Enlightenment Campaign: Government should embark on continuous enlightenment on the waste management strategies and cleanliness which is next to Godliness.
- ii. Ensure Hygienic Environment: Government should ensure hygienic environment, within the cities particularly in the core area of the urban centres to avoid pollution. (Oreyomi M.K, 2005):
- iii. Adequate Funding: More attention should be given to waste disposal management through adequate funding.
- iv. Eradication of Pollution: Government should provide a better means discarding and perhaps the proper management of pollutants in cities which could be by providing enabling environment for Public-Private Partnership (PPP) to curtail the menace. (Oreyomi M.K, 2005):
- v. Recycling: Government should partner with private individuals on how to recycle some of the wastes generated in our hospitals. It is obvious that no hospital can do without generating waste on daily basis. This will create employment opportunities to some of our graduate who are yet to be employed hence, make our environment worth living.
- vi. Awareness and orientation: There is need for environment and public health education on the danger posed by waste dumpsite in the area. Also, hygienic studies from primary education to the tertiary level should be introduced.
- vii. The public needs to be enlightened on proper waste generation and disposal practices including sorting of wastes. This can be achieved through enlightens campaign on TV, radio

and postal to educate the citizen on it. Adequate information should be made available for users at dump site on how to deposit their wastes. (WHO 2006) There is also a need to introduce medical waste management in the hospital curriculum so that they could be informed on the need to maintain a clean and healthy environment.

viii. Based on this research and findings there is no findings there is no functional incinerator at the Ekiti state waste management and recycling project. Instead wastes that are not useful are burnt in the open which is not healthy for the environment. Incinerators are a source of steam for industries that require steam as their source of energy and these industries could be located near incinerating plants which in turn serves as a source of revenue. (Henry and Heike 1989)

### **5.3 CONTRIBUTIONS TO KNOWLEDGE**

This work has helped to conceive and designed the study, thereby performing the literature search, carrying out the study, acquiring the data, statistical analysis, and writing the paper, clinical and experimental studies, acquisition and analysis of data.

### **5.4 LIMITATIONS**

1. The sample for the study is restricted to Ado Ekiti, Ikere Ekiti, Iworoko Ekiti and Ikole Ekiti. Hence, findings cannot be generalized.
2. The size of the valid sample is restricted.

## References

- Awosusi, A. O. (2010). Assessment of Environmental Problems and Methods of Waste Management in Ado-Ekiti, Nigerian. *Indexed African Journals*, 333-335.
- Bryman, A. (2004). *Social research methods*. oxford: oxford university.
- Irin, S. (2018). An analytical study on medical waste management in selected hospitals located in chennai city. *Environ Waste Management and recycling*, 5.
- Irin, S. (2018). An analytical study on medical waste management in selected hospitals located in Chennai city. *enviromental waste management and recycling*, 5.
- Longe E.O, W. A. (2006). PREMILINARY STUDY OF MEDICAL WASTE I MANAGEMENT IN LAGOS METROPOLIS NIGERIA. *Envirom health and science engineering*, 135.
- Melanen, M. (2016). *Waste Management in Hospitals, Case Project with Ecosir Oy and Eksote*. Saimaa University of Applied Sciences.
- Ngwuluka Ndidi1\*, O. N. (2009). Waste management in healthcare establishments within Jos Metropolis Nigeria. *African Journal of Environmental Science and Technology*, 461.
- Ngwuluka Ndidi1\*, O. N. (2009). Waste management in healthcare establishments within Jos Metropolis, Nigeria. *African Journal of Environmental Science and Technology*, 459.
- Olufisayo, A. A. (2014). Solid Waste Management in Ado municipality, South-Western Nigeria. *International Journal of Engineering Science Invention*, 37.
- Olufisayo, A. A. (2014). Solid Waste Management in Ado municipality, South-Western Nigeria. *International Journal of Engineering Science Invention*, 38.

Adedibu A.A, (1988); Solid Waste characteristics and Management in Ilorin. Journal of the Nigerian Institute of Town Planners. Vol. III.

Adegoke A.A, (1989); Waste management within the context of sustainable development in Nigeria, Workshop notes.pp 103110.

Clark, RM (2002). Measures of Efficiency in Solid Waste Collection. Journal of Environmental Division ASCE 99, NEE 4, pp. 447 – 459.

Federal Ministry of Housing and Environment, F.M.H.E (1983); the state of environment in Nigeria. Monography Series No. 2 Solid Waste Management in fifteen cities and urban Nig.

Henry J.G and Heinke G.W (1989); Environmental Science and Engineering Prentice Hall Inc. Englewood Cliffs, New Jersey.

Murray and Lopez (1996); The global burden of diseases, Geneva, Harvard University press for the World Health Organization

Olanipekun J.A. Oyeniya P. and Konwea P.E. (2007): Assessment of Solid Waste Management In technique Ekiti State Urban Areas Nigerian School Health Journal. 19(2) 75-82

Oreyomi M.K, (2005): Principles and Practice of Environmental Health. 2<sup>nd</sup> Ed. Kingson

WHO (2006); Involvement of Public in the Solid Waste Management in area of Health and Environmental Education