



Health Implications of Hospital Waste Management Practices in Gujrat, Pakistan



**A thesis submitted in partial fulfillment of the requirements for the degree of
Master in International Environmental Studies**

By

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*In the name of Allah,
the Most Beneficent,
the Most Merciful*

DEDICATION

I humbly dedicate this research work to Almighty Allah, Who is my well-wisher!

DECLARATION

I, Yasir Nadeem hereby declare that this thesis titled;

**"HEALTH IMPLICATIONS OF HOSPITAL WASTE MANAGEMENT
PRACTICES IN GUJRAT, PAKISTAN"**

is a result of my own research findings and investigations. This work has not been previously printed, published and submitted in any university or research institute.

Signature.....

Date.....

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TABLE OF CONTANTS

DEDICATION.....	iii
DECLARATION.....	iv
ACKNOWLEDGEMENTS.....	v
TABLE OF CONTANTS.....	vi
LIST OF ABBREVIATIONS.....	ix
LIST OF FIGURES AND LIST OF TABLES.....	x
ABSTRACT.....	xi
1. INTRODUCTION.....	1
1.1 Research Objectives.....	2
1.2 Thesis Outline.....	3
2.0 REVIEW OF LITERATURE.....	4
2.1 Defining Medical Waste.....	4
2.2 Nature of Hospital Waste.....	5
2.3 Hospital Waste Management Systems in Different Developing Countries.....	6
2.4 Hospital Waste Management Systems In Pakistan.....	8
2.5 Hospital Waste Management Policy: Guidelines and Rules in Pakistan.....	9
2.6 Consequences of improper waste management system.....	9
3.0 METHODOLOGY.....	10

3.1	Sample size of the study.....	10
3.2	Study Area.....	11
3.3	Site Selection.....	12
3.4	General Description of Gujrat City.....	13
3.5	Challenges in Data Collection.....	15
3.5.1	Challenges at Hospitals.....	15
3.5.2.	Challenges at Waste Dumping Site.....	15
4.0	HOSPITAL WASTE MANAGEMENT PRACTICES	
	IN GOVERNMENT AND PRIVATE HOSPITALS OF	
	GUJRAT, CITY.....	16
4.1	Types of Waste produced.....	17
4.2	Quantity of Waste Produced.....	18
4.3	Waste Treatment and Disposal Methods.....	19
4.4	Storage, Transportation and Final Disposal of Hospital Waste.....	21
4.5	Burning of Hospital waste.....	22
4.6	Recycling of waste.....	22
4.7	Comparatively Analysis of HWM Practices Between Government and Private Hospitals.....	23

5.0	IMPACTS OF HOSPITAL WASTE ON THE	
	HEALTH OF PEOPLE LIVING AROUND	
	WASTE DUMPING SITE;SHEIKH SUKHA.....	25
5.1	Background Information about Sheikh Sukha Waste	
	Dumping Site.....	25
5.2	Burning of Waste and Its Associated Diseases.....	26
5.3	Open Waste Dumping and Its Associated Diseases.....	27
5.4	Respondents Suggestions for Possible Improvements	
	in Waste Disposal System.....	27
6.0	CONCLUSIONS.....	29
7.0	REFERENCES.....	31
	APPENDIX 1 (INTERVIEW).....	34
	APPENDIX 2 (QUESTION GUIDE).....	38
	APPENDIX 3 (Pictures).....	40

List of Abbreviations

AIDS	Acquired Immune Deficiency Syndrome
EPA	Environment Protection Agency
HCWM	Healthcare Waste Management
HWM	Hospital Waste Management
ISWM	Integrated Solid Waste Management
HIV	Human Immunodeficiency Virus
IUCN	International Union for Conservation of Nature and Natural Resources
Kg	Kilogram
MSW	Municipal Solid Waste
MWTA	Medical Waste Tracking Act
NMBU	Norwegian University of Life Sciences
PEPA	Pakistan Environment Protection Agency
SWM	Solid Waste Management
TMA	Tehsil Municipal Administration
US	United States
WHO	World Health Organization
WTE	Waste-to-Energy

Figure No.	List of Figures	Page No.
Figure 1	Sheikh Sukha Map Pakistan Google Satellite Maps	12
Figure 2	Map of Gujrat, City http://gujratcafe.wordpress.com/2012/07/09/gujrat-a-city-blessed-in-its-own-way/	13

Table No.	List of Tables	Page No.
Table No. 1	Important Figures of City Gujrat:	14
Table No. 2	Number of interviews conducted from government and private hospital's staff members	16
Table No. 3	Types of waste produced in two Government Hospitals of Gujrat, City	17

Abstract

The present research was conducted to investigate the health implications of hospital waste management practices in Gujrat, Pakistan. For this purpose two government and two private hospitals were randomly selected in the city of Gujrat. To find out the health implications, Sheikh Sukha waste dumping site was selected. Personal visits were made to hospitals and waste disposal site to record the actual conditions. Qualitative method was used in this research for data collection.

For the collection of data twenty interviews were conducted (5 in each hospital) from hospital staff. To investigate impacts of waste on health of people living around waste dumping sites, for this purpose researcher visited Sheikh Sukha waste dumping site and a separate question guide was prepared. Twenty respondents (10 male and 10 females) were selected and preference was given to those who have some kind of infectious diseases.

Findings of this research illustrated that the overall implementation level of HWM rules 2005 in terms of collection, segregation, storage, disposal and transportation in private hospitals were much better than government hospitals due to their strict management, regular monitoring, proper documentation, future planning, regular cleaning, less waste production and their tough competition among themselves to achieve their financial targets. This research also revealed TMA, collects all waste from hospitals. Get mixed with municipal waste then, finally disposed of at Sheikh Sukha waste dumping site. However due to lack of proper waste management system some chronic diseases such as headache, fever, skin and eyes allergies, Hepatitis C, asthma, throat and lungs infections are very common especially among those people who are living around Sheikh Sukha waste dumping site because of open waste dumping and burning.

Therefore, based on these findings, there is an urgent need to create awareness about hospital waste management practices. Hospital administration should strictly focus on health education and intensive training. In addition, the government of health should strictly enforce penalties against the offenders. This research also suggests that rather than open burning and mixing of infectious waste with municipal waste "Incineration" practices should be adopted.

1. INTRODUCTION:

Unfortunately, in most developing countries, proper waste management system does not exist. Currently, for risk or hazardous waste management on small scale, some methods are in use such as on-site incineration, steam disinfection and autoclaving. The countries where the incineration practice is common are Brazil, Argentina, India, Pakistan, Bangladesh and Peru. Especially in developing and poorer countries, the performance of incinerators is very bad and mostly non-operational. Normally, medical institutions focus on the installation of waste disposal technologies such as incineration but remain unable to enforce the waste management practices within the hospital. World-widely, there are some techniques which are used in different countries such as Incineration, microwave disinfection, autoclave disinfection and chemical/mechanical disinfection. Other methods are also used to dispose of medical waste, e.g. burial, burning, dumping, removal of municipal bins and selling etc (Akter 2000).

In Pakistan, hospital waste is collected by sweepers, and then transported to the city's open waste dumping sites. In Government hospitals, there are no special techniques for waste handling, and due to lack of awareness, hospital staff normally treat all solid wastes carelessly. Municipal transport is used to collect and dispose of the hospital waste in any open dumping site alongside city garbage (Ahmed 1997). Normally, hospital waste and domestic waste are mixed together on the roadside and then disposed of. Sometimes, to get rid of this waste, it is simply buried without complying with any rules and regulations. The bitter reality behind such actions is that although the necessary technologies and equipment are available to ensure proper hospital waste management within the country, the unawareness among staff and local people regarding effective disposal techniques and policies hinders their implementation (UIHaque 2006). However, Pakistan is at a crucial stage where there is an urgent need to create awareness about the hazardous impacts of waste on human health as well as the environment. Moreover, strict measures are needed to implement hospital waste management technologies (Rasheed et al. 2005).

The present study is based upon the comparison of waste management practices of two Governments and two Private hospitals in the City of Gujrat, Pakistan. Moreover, this research will discuss the impacts of hospital waste on the health of people especially those who are living near the dumping sites.

1.1 Research Objectives:

The study focused on the following specific objectives of the research and sub questions are added for further clarification.

- 1.** To study the practices of hospital waste management in Government and private hospitals of Gujrat City, Pakistan.

Research Questions:

- a) What types of technical methods and practices are used to manage the waste in the Government and private hospitals?
 - b) To what extent are the practices used for medical waste management in government and private hospitals in line with the guidelines of government of Pakistan?
 - c) What are the reasons behind a hospital's compliance or non-compliance with government waste disposal guidelines?
- 2.** How waste management practices in private hospitals compared with the waste management practices in Government hospitals in the city of Gujrat, Pakistan.

Research Questions:

- a) What are the differences regarding waste management practices between private hospitals and Government hospitals?
- b) What are the reasons behind these differences?

3. To investigate the impacts of hospital waste management on the health of people.

Research Questions:

- a) What are the impacts of hospital waste management on the environment and the health of people living near dumping areas?
- b) How could the impacts of hospital waste management be minimized?

1.2 Thesis Outline:

This research work begins with introduction followed by research objectives and literature review on hospital waste management systems from Pakistan and internationally. Chapter 3 gives an overview of the study area as well as the methods and sampling techniques used in the research.. Chapter 4 provides the detailed results and analysis of primary and secondary data collected and discussions on different techniques and practices used in the waste management system. Chapter 5 discusses the overall impacts of waste on the health of people living around the waste dumping sites followed by a conclusion which presents the overall research findings.

2.0 REVIEW OF LITERATURE:

This chapter discusses different previous studies which have been done on hospital waste management systems in different cities of Pakistan and also in other countries. Hospital waste management is an important issue in Pakistan and other developing countries. Different researches conducted on this issue conclude that hospital waste is usually poorly handled by hospital administration and staff, respectively. Improper hospital waste management can cause serious health impacts on the people within the hospital and nearby communities (Kumar et al. 2010). Literature review explains the research topic and provides the information and proper guidelines to the researcher and reader about the same research topic through previous research (Mertens, 2010).

2.1 Defining Medical Waste:

There are different concepts of waste management. However, in this research the concepts proposed by WHO,1999 (World Health Organization) such as classification of medical waste, the nature of medical waste, and hospital waste management techniques and methods are described. World Health Organization (WHO, 2014) defines medical waste as Waste produced by health care activities including a wide range of materials, from used syringes and needles to soiled dressings, diagnostic samples, body parts, pharmaceuticals, chemicals, blood, medical devices and radioactive materials. Whereas US Medical Waste Tracking Act (Mwta, 1998), defines medical waste as Any solid or liquid waste that is produced in the, treatment, diagnosis or immunisation of human beings or animals, or in the production and testing of biological organism. All types of wastes which are produced by hospitals, doctor's clinics or offices, medical and research departments are considered as medical wastes (Srishti 1998).

World Health Organization (WHO, 1994 and 1999)has classified medical wastes into eight different categories, which are as follows;

- 1) Pathological waste
- 2) Chemical waste

- 3) Sharps
- 4) Pharmaceutical waste
- 5) Pressurized containers
- 6) Radioactive waste
- 7) Infectious waste and Potentially infectious waste
- 8) General waste

However, for practical purposes, WHO, 1994 has recommended a simplified classification of medical waste, especially for developing countries. This classification includes infectious wastes, chemical and pharmaceutical wastes, sharps, general non-toxic wastes, and other toxic medical wastes (Srishti 1998). Hospital waste includes risk or hazardous, and non-risk or non-hazardous waste. Risk waste comprises infectious waste, sharps, chemical waste, pathological waste, genotoxic waste, pharmaceutical waste, and radioactive waste etc, whereas, non-toxic waste includes garbage, packages, card-boards, organic food-stuff that patients or their relatives' leftovers (Rasheed et al. 2005).

2.2 Nature of Hospital waste

Different researches illustrate that only small proportion of overall medical waste considered as hazardous waste, yet the main sources of hazardous/toxic waste are clinics and hospitals, whereas a small amount of hazardous waste also comes from industrial and domestic sources. According to WHO (World Health Organization) 1994, almost 85% hospital waste are non-hazardous, around 10% infectious and only 5% are hazardous but non-infectious.

This range varies in the case of different countries. For example, in the United States, almost 15% of hospital waste is considered as infectious waste. In the case of India, this range varies between 15-35%, whereas in the case of Pakistan, around 20% of the hospital waste is considered as potentially hazardous or infectious. This variation depends on the overall amount of waste which is generated within the country (Akter 2000).

Hospital waste management has become a burning issue due to the increasing evidence of poor management which has led to health and environmental hazards. A study done by Akter (2000), for example, found that a variety of methods used by medical institutions to dispose of their infectious or non-infectious waste, such as burning, dumping, burial, selling treatment with chemicals and mixing with municipal waste, has led to severe contamination of the environment and may have caused serious health impacts to the nearby community.

To dispose of medical infectious waste, there are some techniques which are recommended and used to varying degrees all over the world. These techniques are incineration, disinfection, mechanical/chemical disinfections, microwave disinfections and autoclave. Each technique has some conditions regarding waste composition, technical aspects and environmental conditions (Asante et al. 2014). Hospital waste management system mainly depends on a well-organized and good administration system. In addition, it also requires active participation of well informed and trained staff, as well as proper legislation and financing system (Subramani, 2014). While the regulation of hospital waste has proven to be effective in most of the developed world, the situation in the developing world continues to be a challenge.

2.3 Hospital Waste Management Systems in Different Developing Countries

In developing countries, some processes e.g on-site incineration, steam disinfection, microwave disinfection, autoclave disinfection, and mechanical/chemical disinfection are currently in use for managing harmful waste but on a very small scale. Normally, incineration practices are found in Argentina, Brazil, Peru, Pakistan, India and Bangladesh. In developing countries, hospital waste incinerators operate under sub-optimal conditions and mostly incinerators are non-functional due to different reasons. For example, hospital's administrations focus mostly on installing incinerators but they do not pay attention to its functioning and maintenance. Moreover, the hospital staff from director to waste-collector level seems unaware of safe disposal and proper handling of hospital waste. This study revealed that common methods which are used in Bangladesh are burning, selling, burial and dumping to dispose of medical waste. Usually, government hospitals collect their waste in open bins/common places and leave them for one to two days (Akter, 2000).

Another study done by Subramani (2014) showed that in India, health-care waste is a big issue. India has the second highest population in the world, around 1.12 billion, and it has been estimated that in India around 6 lakh hospital beds are available. Moreover, nearly 23,000 basic health-care units and 15,000 small clinics and private hospitals are present. In India, 420461kg of biomedical waste is generated per day in which only 240682kg of waste per day is treated.

Asante et al. 2014 also reported that Ghana, with a population of 25 million, is not much more familiar with healthcare waste management system. The findings of their study revealed that in Ghana around 6851 beds are available for patients and each bed is generating 1.2 kg of waste per day. Moreover, around 83% of the selected health care institution (total were 120 Health care institutions) in Ghana did not segregate their waste of which only 17% were segregated.

A study done by Joshi (2013) indicated that in Nepal, health care institutions are steadily increasing, and as a result, health care waste is also increasing very rapidly. Different studies revealed that if the hospital's toxic waste get mixed with municipal waste then the entire waste can become potentially toxic which can cause harmful environment impacts. It has been reported that in Nepal in 2001, around 1.7kg/person/day hospital waste was produced whereas 0.48kg/person/day health care risk waste was generated. This study also illustrated that In Nepal, mostly government and private hospitals do not systematically segregate the waste at the point of waste generation. Moreover, the guidelines of color coding and labeling of waste containers are not strictly followed by the hospitals. Normally, hospital waste is being collected in a big container then mixed with municipal waste, as a result the entire waste become hazardous and pollute the environment. Improper management of health care waste can badly affect the health of the hospital's staff, patients, waste workers and general public. According to World Health Organization 2011, it has been estimated that due to reuse of contaminated syringes, globally around 21 million people have been suffered from Hepatitis B, 2 million from Hepatitis C and approximately 260,000 from HIV infections. In addition, it has been reported that in 2009, in the Indian state of Gujarat, around 240 had suffered from Hepatitis due to the re-use of contaminated syringes. Even though in Nepal, legislation regarding waste management system has been enforced, unluckily the implementation level is not fully satisfactory.

Ministry of Health Nepal (2004) carried out an assessment of the improvement of health care waste management. This assessment report showed that health care waste can cause serious

health risks as compared to all other types of waste because it contains many infectious and hazardous substances. The issues of health care waste management are becoming more critical due to the rapidly increasing HIV and AID's incidences. According to this assessment, it was observed that the level of implemented health care facilities in Nepal is still very low compared to international standards.

2.4 Hospital Waste Management Systems In Pakistan:

Kumar et al. (2010) reported that In Pakistan, approximately 250, 000 tons of hospital waste is generated annually. Normally, in Pakistan, hospital waste is poorly managed by hospital's administration and staff, respectively. Hospital waste management is a big challenge for health providing facilities because improper hospital waste can cause serious health impacts to hospital staff and nearby communities. According to the World Health Organization assessment in 2002, around 22 countries in the world (equal to the 64% hospitals) had no proper waste management system. Different studies depict that in Pakistan in 2006, around 92,000 hospital beds were available and approximately 2kg/bed/day hospital waste was generated. In Pakistan, total amount of waste generation is 0.8 million tons per day. It has been estimated that around 12billion injections are used every year. The findings illustrated that in Pakistan, almost all of the hospitals did not follow the health care waste management rules and regulations. Therefore, health-care waste management practices such as segregation, storage, handling, disposal and transportation of waste did not meet the WHO's standards and health care waste management rules of Pakistan, 2005. In Pakistan, hospital waste transmit diseases especially through scavengers who collect infected and used syringes for recycling purposes. A study reported that in Pakistan around 52% of the doctors had suffered needle prick injuries more than once in their lives, while 54% of the health-care workers had received at least one needle injury within the previous 6 months.

A study done by Ahmed (1997) indicated that in Karachi alone, 100 tons of hospital waste is generated per day of which approximately 61% infectious waste and 39% general waste is produced in civil hospitals. Normally at clinics, dispensaries and basic health care units, there is no separate solid waste management system. Waste which is generated in these premises is stored in plastic containers or buckets. Then collected waste is dispose of to the communal bins/identical

garbage heaps which may pose a serious threat to the hospital staff, waste workers, patients and nearby communities.

The findings from one study (Rasheed et al. 2005) showed that 2 out of 8 (25%) hospitals of Karachi segregated their waste at source and kept records of waste generation. Only 25% of hospitals of Karachi had designed a proper storage area with proper drainage, water supply, concrete floor and ventilation system. While 5 out of 8 hospitals (62.5%) had incineration facilities, only two (25%) were using them by putting in dangerous segregated material. Moreover, these 5 hospitals had properly documented waste management plan and team as well.

2.5 Hospital Waste Management Policy: Guidelines and Rules in Pakistan

Since 1998 the guidelines for hospital waste management prepared by Environment and Health Department, under the Ministry of Health, Government of Pakistan have been applicable. These guidelines cover all the hospital waste management aspects within the country (Ul Haque 2006).

Under the provision of Pakistan Environmental Protection Act (PEPA) 1997, section 31, Federal Government of Pakistan issued the new rules, named Hospital Waste Management Rules, 2005 (Government of Pakistan, Ministry of Environment 2005). These rules are applicable to all hospitals, research institutions, laboratories, clinics, dispensaries, blood-banks, maternity centers, nursing homes, veterinary institutions, and also temporary medical camps which may cause hazardous health and environmental impacts as well (Rasheed et al. 2005). According to these rules, proper waste management is the main responsibility of every hospital. The purpose of these rules is to organize a waste management team, to prepare and enforce a waste management plan. These rules also explain the guidelines for hospital waste collection, segregation, storage, transportation, disposal methods, waste minimization techniques, color coding and protective clothing etc. (Punjab Health Sector Reform Support Project, 2013).

2.6 Consequences of improper waste management system:

Improper hospital waste management directly or indirectly affects the whole environmental system in the form of water and soil contamination, effects on food and natural vegetation. Due to lack of proper management and waste disposal system, there are many significant health problems especially in developing countries, such as skin allergies, eyes irritation, diarrhea, fever, cholera, typhoid influenza and allergy are the most common problems especially among workers,

patients and communities. (Ahmed 1997). Although everyone who is exposed to hazardous waste is potentially at risk, it is the group of people who directly belong to medical profession, as well as waste workers, scavengers, patients and their visitors in the hospital who are highly at risk. Different researches illustrate that there are numerous diseases which can be transmitted among the group of people who are highly at risk but most significant diseases are Hepatitis B and C, as well as and AIDs (Acquired Immunodeficiency Syndrome) (Rasheed et al. 2005; Kumar et al. 2010).

3.0 METHODOLOGY:

In any research project, methodology refers to the approach and techniques which are used to collect, organize and interpret the data. This study is based on both primary and secondary sources. Secondary data regarding hospital waste management techniques was collected from internet sources, books, journal articles, and reports. Qualitative methods were used to collect primary data, including interviews with key informants using question guides composed of both open and close ended questions. Interviews were held with the hospital's staff, doctors, administration and general public living near the dumping sites. To view onsite conditions of the hospital waste and to collect visual data, field visits were made where personal experience was used and observations were made.

3.1 Sample size of the study:

A random sampling technique was used to select the respondents from the hospitals and dumping site areas. To collect the information regarding hospital waste management practices within the hospitals of Gujrat city, 20 interviews (5 Interviews in each hospital) were conducted. These interviews were conducted with the hospital's medical staff, administration and medical students practicing in the hospital. The structure of the interview is given in Appendix 1.

Moreover, to collect the data about the impacts of waste on the health of people living around dumping areas, a separate question guide was prepared and filled from Sheikh Sukha population living near to waste dumping site. Total number of respondents was 20 (10 male and 10 females). The respondents were selected randomly and preference was given to those who have some kind of infected diseases. Personal visits were made to hospitals and waste disposal site to

record the actual conditions. The question guide is given in Appendix 2 and some of the pictures taken from the site are placed at the end of the research.

3.2 Study Area:

This research study has been conducted in Gujrat city and was selected because of a number of health issues emerged during the last couple of decades. Unluckily, there are only two government hospitals in the city, but on the other hand, there are many private hospitals. Due to overpopulation, only two government hospitals are not able to provide the basic medical facilities to the patients. For that reason, to get urgent access to basic medical facilities, most people prefer to go to the private hospitals. Therefore, to describe, evaluate and compare between the existing practices of hospital waste management in government and private hospitals, this city was selected. To get the information about hospital waste management, interviews with hospital staff, management and medical students have been conducted. These interviews were conducted in two government and two randomly selected, private hospitals. Names of these hospitals are not mentioned due to confidential reasons.

Moreover, to get the information about the impacts of hospital waste on the health of people especially living near the dumping areas, question guide was used to collect data on prevailing diseases in the village of Sheikh Sukha. This village was selected because it is mainly situated on Phalia road beside the dumping site. Sheikh Sukha is the biggest waste dumping site in Gujrat. This site is 12 km away from the city. For the past 9 years this site has been under TMA (Tehsil Municipal Administration) and has been used as a waste dumping site. In Gujrat city, approximately 200-250 tons solid waste is produced per day of which around 90 tons per day is being disposed of on this site (Gujrat City Profile, n.d). Total land is approximately 8 acres and around 10-12 thousand people are living near this site (Gujrat City Profile).

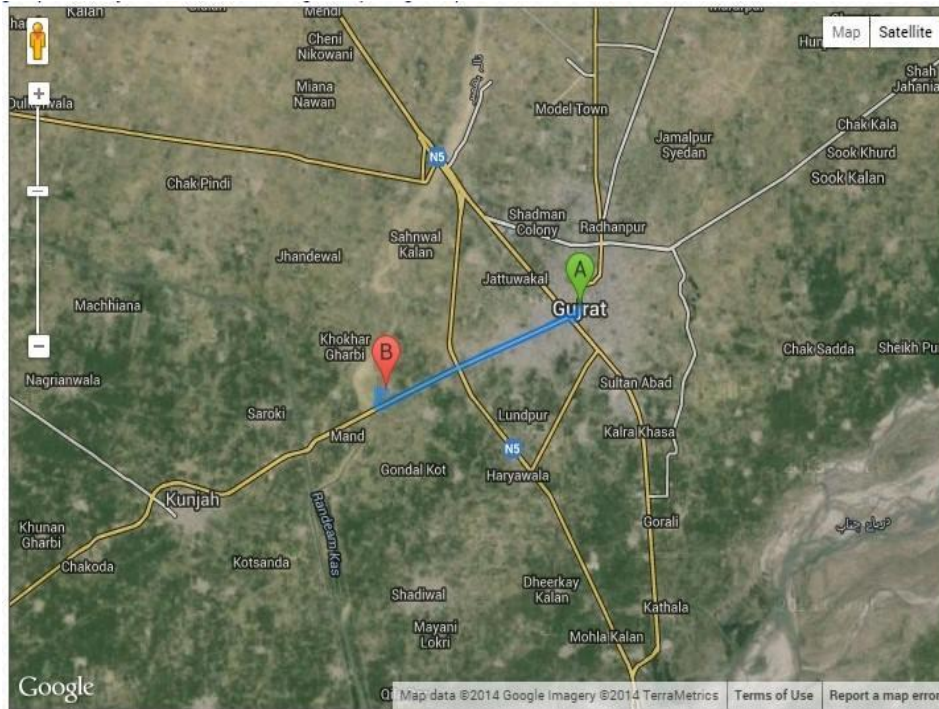


Figure 1: Sheikh Sukha Map| Pakistan Google Satellite Maps: Access n 09/08/14

3.3 Site Selection:

In the city of Gujrat, there are only two Government hospitals, both of which were included in this study. There are, however, lots of private hospitals in the city, out of which two hospitals were randomly selected, referred to in this study as Private hospital 1 and Private hospital 2. Similarly, the two government hospitals are referred to as Government hospital 1 and Government hospital 2.

Private hospital 1 and 2 have different medical facilities ,e.g. Medical, Neurological, Surgical I.C.U, Orthopedical etc. and providing 24 hours service. The names of these hospitals are not mentioned in this research project because of confidential reasons.

Beside these, a waste dumping site of Sheikh Sukha was also selected to find out types of diseases spread from the waste lying around the village. There are no health statistics available in the government departments on the ways hospital waste is impacting the health of people and the types of diseases that are spread out in the study area. Therefore, the researcher depends on

primary data collected from the respondents about their perceptions on and experiences of the impacts of waste on their health and various diseases the people face.

3.4 General Description of Gujrat City:

The current city of Gujrat was established in the early 19th century during the British empire. It is situated along main railway line and Grand Trunk Road, normally abbreviated as G.T road. It is connected with other prominent cities of Pakistan such as Gujranwala (62 Km), Lahore (134 Km), Sialkot (63 Km) and Sargodha (195 Km) by road as shown in Figure 2. This city is located between two big rivers, Chenab River and Jhelum River.



Figure 2: Map of Gujrat, City

Source: <http://gujratcafe.wordpress.com/2012/07/09/gujrat-a-city-blessed-in-its-own-way/>

Gujrat is an industrial city of Pakistan. Major industries like ceramics, fans, furniture, shoes, PVC pipes, motor cycles and clothes etc. are playing a significant role in increasing the economy of Pakistan. Gujrat is very popular for ceramics industry. Around 101 ceramics production units are working in this city which consists of total 60% units of the Punjab. Gujrat is considered as the biggest fan manufacturers in Pakistan. In the city, fan manufacturing industry started already before the Indian partition.

Table 1. Important Figures of City Gujrat:

Creation of the City	522 B.C
Population	386,046 (Estimated in 2013)
Number of Union Councils	18
Area of the City	31.52 sq. Km
Literacy rate	72.2 %
Average household size	7.0
Population growth rate	2.89 %
Main tress	Shisham, Kikar, Toot and Poplar tress
Average rain fall rate	67 cm
Main Industries	Ceramics, Fans, Shoes, PVC Pipes, Motorcycle and Clothes
Number of Government Hospitals in the City	2
Number of Private hospitals	Approximately 50
Temporary Waste Disposal Sites	3 (Sheikh Sukha is the biggest)
Total Waste Produced (Hospital + Municipal)	200-225 Tons/day

Sources: Gujrat City Profile (n.d); The Urban Unit P and D Department, Punjab

*Situation Analysis Report for Integrated Solid Waste Management (ISWM)
in Gujrat, 2013..*

3.5 Challenges in Data Collection:

During data collection through interviews at hospitals, I faced many challenges. Some are mentioned here;

3.5.1 Challenges at Hospitals:

One of the biggest challenges was to get the permission from the medical superintendent of government hospital 1 to conduct interviews within the hospital. Because of confidential reasons, I am not mentioning the names of these interviewees. Another major challenge was the non-cooperative behavior of the hospital staff. To collect proper and useful information regarding hospital waste management, I discussed informal and non-interview related matters with the respondents. Initially, hospital staff and administration were considering me as a journalist or a tax officer. That was the reason they were feeling reluctant to give me any information regarding waste management. Therefore, to resolve this issue, I had to share with them my complete background and current student status at NMBU. Moreover, initially, when I was taking pictures of waste containers and waste collection sites, they were reluctant but when I convinced them that every information will be confidential then with the help of some staff members and medical students I was able to take some pictures of the waste bins, the incineration plant, the waste collection sites and the place where the hospital management were burning the toxic waste etc. Some pictures are given in Appendix 3.

3.5.2. Challenges at Waste Dumping Site:

During data collection through question guide at Sheikh Sukha waste dumping, I also faced many challenges. Some challenges are given below;

To conduct data from men was comparatively easier than from women because of social issues. Being a stranger, people mostly felt reluctant to talk to me about the health impact of waste. Mostly, people believed that I am from a government department and therefore, they were complaining to me about the open waste disposal. Initially, it was very difficult to convince the people about my research work but luckily, I found a person who had been a servant at my father's firm in the past. Since he was a native of that area, he was able to help me by convincing the people, especially in regards to collecting the data from women.

4.0 HOSPITAL WASTE MANAGEMENT PRACTICES IN GOVERNMENT AND PRIVATE HOSPITALS OF GUJRAT, CITY:

This chapter focuses on the results and findings of the researcher about the practices used for HWM (Hospital Waste Management) in both government and private hospitals of Gujrat City. The results and discussion are based on qualitative data which was collected from the hospital staff and the community. To find out the proper and accurate results about the existing practices of HWM and their differences between Government and Private hospitals of Gujrat City, interviews were conducted among the hospital staff and administration. Details of the conducted interviews with the staff of the hospitals is given in Table 2:

Table 2: Number of interviews conducted from government and private hospital's staff members

Hospitals	HWM Incharge	Nurse	Adminis -tration	Laboratory Assistant	Medical Student	Ward Servant	Sanitary Engineer	Tota l
Government Hospital 1	0	1	1	1	1	1	0	5
Government Hospital 2	1	1	1	1	0	1	0	5
Private Hospital 1	1	1	1	1	0	0	1	5
Private Hospital 2	1	1	1	1	0	0	1	5
Total	3	4	4	4	1	2	2	20

In the city of Gujrat, there are two government hospitals which were selected for this research project. Gujrat is a big and congested city, having an estimated population of 386046 in 2013. Therefore, to meet the medical requirements of the citizens, there are many private hospitals in the city. The number of private hospitals is around 50. For this research project, only two private hospitals out of the 50 were randomly selected based on their popularity and performance. To find out the most accurate and reliable information about the existing practices of HWM and their differences between the selected government and private hospitals, 20 interviews (5 interviews

from each hospital) were conducted with the hospitals' staff. To get further in-depth information about HWM practices, researcher personally visited these hospitals, the waste storage areas and different surgical and medical wards in the aforementioned hospitals. Informal interviews and discussions with the in-charge staff members of the hospitals were held and practically observed the existing situation in all selected hospitals.

4.1. Types of Waste produced:

In the government hospitals, the researcher through interviews and personal observation found that almost every type of hospital waste is produced. Types of waste generated in these two government hospitals are mentioned in Table 3:

Table 3: Types of waste produced in two Government Hospitals of Gujrat City:

General Waste	Infectious Waste	Recyclable Waste	Non-Recyclable waste
Food-Leftovers, Kitchen-waste, Papers, Cardboard, Garden waste, Debris, Packing-materials, x-rays sheets, tins, plastic bags etc.	Disposable syringes, scissors, Blades, Urine bags, Glucose bags, Blood bags, Bandages, dressings, organs, Tissues, Pus, Empty glass vials, Infusion-tubes, Plastic bottles etc.	Disposable syringes, Infusion tubes, Empty glucose bags, Blood and urine bags, papers, plastic bottles, Irons tins, Metals, Glass-ware, Cutter, Card-boards etc.	Used cotton for dressing, Garden waste, floor and street sweeping waste, Garden waste etc.

In private hospitals of Gujrat City, the analysis of the data shows that almost the same types of waste as mentioned in table 3 is produced. However, there are differentiation in the quantity produced as well as management practices. The below section gives details of the waste generated in both private and government hospitals.

4. 2 Quantity of Waste Produced:

To calculate the waste generation rate of these hospitals, no actual measurement and analysis system existed. However, the measurement is based on the formula taken from Ahmed (1997). The hospital's record illustrated that on an average, 250 patients are treated per day in these two government hospitals. Each patient is producing on an average 150gms waste per day. The below formula is used to calculate the average waste generation.

$$\text{Waste Generation Rate} = \text{Average waste production/patient/day} \times \text{Total no. of patients visited/day} \\ \times \text{Total no. of hospitals}$$

$$\text{Waste Generation in Government Hospitals} = 150\text{gms/patient/day} \times 250 \text{ patients/day} \times 2 \\ \text{Government hospitals} \\ = 75000\text{gms}$$

$$\text{In Kilograms} = 75000/1000 = \mathbf{75\text{kg/day}}$$

According to formula application, The, calculated waste generation rate in government hospitals is 75 Kg per day.

To calculate waste production rate in private hospitals of Gujrat City, the same formula has been applied because in both private hospitals actual measurement and assessment system was also not existed. Collected information regarding waste production in private hospitals revealed that on an average 150 patients are treated every day in these two private hospitals. Each patient is producing around 80gms waste per day. Therefore, the calculated average waste production in both private hospitals is given below;

$$\text{Waste Generation in Private Hospitals} = 80\text{gms/patient/day} \times 150 \text{ patients/day} \times 2 \\ \text{Private hospitals}$$

$$= 24000\text{g/patient/day}$$

$$\text{In Kilograms} = 24000/1000 = \mathbf{24\text{kg/day}}$$

The calculation is based on data collected from the hospital administration; therefore according to formula 24Kg per day hospital waste is produced in both private hospitals.

The above calculations show that the overall waste production in government hospitals is greater than private hospitals. The reason is that in government hospitals the number of patients that visit per day are higher than in the private hospitals. Moreover in private hospitals due to strict management only one helper with patient is permitted while in government hospital there is always a higher number of non-patient visitors. Based on above formula, private hospitals produce 0.16 Kg per patient, on average, while government hospital produce 0.30 Kg per patient. However, in both private and government hospitals there is a lack of actual measurement and analysis system of waste generation. Unfortunately due to lack of accurate information on waste generation, future planning for proper waste management system may not be possible.

4.3 Waste Treatment and Disposal Methods

The collected information through interviews with the hospital staff and visual examination by the researcher demonstrated that in government hospital SWM (Solid Waste Management) system comprises of separate waste storage area at dedicated places within hospital vicinity. Sanitation staff including sweepers and waste collectors clean the hospital's individual area, collect the hospital waste and dispose of this waste at identical garbage heaps. TMA collect this waste with domestic waste and finally dispose of at waste dumping sites.

In these government hospitals, no color coding scheme for the collection of plastic, paper, glass and other infectious waste was observed by the researcher. Only in one place of Government hospital, containers with two colors (Blue and Yellow) were seen but unfortunately, all of the hospital waste got mixed in these containers by the visitors. A picture of these containers is given in Appendix 3. Normally, hospital waste is collected in common plastic buckets or containers. After collection, which is done by sweepers and waste collectors, this waste is temporarily disposed of around hospital territory which make identical garbage heaps. For final disposal, this waste is being collected by TMA after 3-4 days. One respondent answered that, when this area becomes full with the garbage, only then the TMA collect and finally dispose of this waste at Sheikh Sukha dumping site.

For the private hospitals, the information collected through interviews, informal discussion with hospital staff and personal observation by the researcher demonstrates that the status of waste treatment and disposal methods in the private hospital was slightly different than in the government hospitals of Gujrat City. Even though, for collection and segregation of waste, no color coding scheme was observed in anywhere of these hospitals, the main difference observed was that after collection of waste no open dumping and no identical garbage heaps was found in the hospital's premises. Moreover, for collection of waste in wards, each bed had its own basket wrap with biodegradable plastics bags. Pictures of these baskets is shown in Appendix 3. All of the infectious and general waste was collected in separate baskets. The respondent in private hospital told that the hospital's administration hired sweepers on contract basis. These sweepers collect waste and clean each ward every morning and evening.

In both government and private hospitals no color coding scheme for collection and segregation of waste was observed due to lack of training and knowledge about the meaning and differences of these colors. For effective segregation, Kumar et al (2010) suggested a color coding scheme which is given below;

Green:	For organic waste
Red:	For risk waste with sharps
Blue:	For risk waste without sharps
Black:	For non-risk/General waste
Yellow:	For radioactive waste (Kumar et al, 2010)

However, the overall status of waste treatment and disposal in private hospitals was much better than in government hospitals because in private hospitals infectious waste was separately collected. For collection of general waste each bed was provided a separate basket wrapped with a biodegradable plastic bag. After collection waste was temporarily disposed of in a separate container which was lying on a separate storage area with properly locked system. No open dumping around hospital premises was observed. These differences regarding waste collection and disposal system shows the better waste management system of private hospitals than government hospitals.

4.4 Storage, Transportation and Final Disposal of Hospital Waste:

In government hospitals on asking about the storage of this waste researcher came to know that after collection of this waste it is openly dumped around hospital premises. After 3-4 days when this area become filled TMA van collect and transported this waste for final disposal at Sheikh Sukha.

Whereas in private hospitals respondents told to the researcher that after collection of waste from each ward, For temporary storage we have separate container and trolley outside the hospital building, sweepers throw-off all of the hospital waste in "Blue color" container and "Yellow color TMA trolley" (Shown in Appendix 3). Respondents also told that , every early morning TMA vans collect all of these wastes from these containers from the private hospitals, then get mixed with municipal waste and transported for finally dispose at a biggest waste dumping site of Gujrat, which is known as Sheikh Sukha. Private hospital's administration told to the researcher that TMA collect this waste on monthly charges around 7000-10,000 Rupees (approx.; 70 to 100US\$).

In the case of government hospitals, after the collection of waste from each ward it was openly dumped around hospital premises making identical garbage heaps. To collect the recyclable products from these garbage heaps there was an open access for scavengers. TMA is a government organization and therefore, due to lack of strict monitoring by the hospital administration usually, after 3-4 days TMA vans collect this waste and transport it to the final disposal site. During summer and rainy seasons, these open garbage heaps produce mosquitoes and house flies. On other hands private hospitals, due to strict monitoring by hospital administration, waste primarily stored in containers and trolleys are regularly transported by TMA to the final disposal site. To prevent the access of scavengers, waste storage area was completely locked. Moreover, to prevent ill smelling production, some chemical sprays were used by the sanitation staff. Due to regular transportation of waste, hospital area was found completely clean and tidy. These differences illustrated that in private hospitals the waste management practices regarding storage, transportation and disposal were much better than in government hospitals.

4.5 Burning of Hospital waste:

In government hospitals researcher also observed that behind the hospital buildings, big holes were found. On asking from sweepers about the reality of these holes, they replied that, on the instructions of the hospital's administration, they filled these holes with infectious and hazardous waste which they got rid of by burning.

On asking the reason of burning this hazardous waste, respondent replied that only in one Government hospital of city Gujrat, there is an incineration plant. This plant was installed on 16th May 2013 by the contribution of WHO to prevent blood borne infectious diseases such as viral Hepatitis and HIV/AIDS but unfortunately, it has been non-functional since July 2013 because of non-availability of a technical person, lack of fund and maintenance charges. Therefore, for hospital waste management there is no other option than burning to get rid of this infectious and hazardous waste.

In the case of private hospitals, any information regarding waste burning inside or outside of the hospitals was not collected. On asking, hospital staff mentioned that burning of waste is a serious crime because it can cause many health hazards. Therefore the hospital management can't allow burning of infectious and hazardous waste. However, there is no incineration plant in private hospitals.

4.6 Recycling of waste

The researcher analyzed the existing status of hospital's recyclable waste on the basis of interviews and informal discussion with hospital staff and on visual examination during these government hospital visits. Researcher came to know that empty glass/plastic bottles, containers and tins were mainly re-used by doctor's assistants and compounders without sterilizing them. However, recyclable products such as glucose bags, urine bags, tins, used syringes, paper, cardboard, plastic bottles and infusion tubes were collected and sorted by the sweepers and scavengers within hospitals premises and outside the hospital boundaries respectively. Sweepers and scavengers perform these duties without realizing the serious health issues such as Hepatitis B, C, HIV/AIDS and many other allergic issues which can be caused by handling and due to contact with these infectious/toxic wastes. On asking about the reason for the collected and

sorted recyclable waste, respondents mostly replied that these recyclable products can be easily sold on for good prices at scrape yards.

For the private hospitals, the recycling status is also almost similar as that in the government hospitals. The recyclable products which are produced in private hospitals are collected and sorted by sweepers. On asking about the collection and treatment of recyclable waste, respondents replied that during collection and cleaning of wards, sweepers normally sorted all of the recyclable products and store them in separate containers. When the container becomes full, they sold all of these products at scrape-yards.

4.7 Comparative Analysis of HWM Practices Between Government and Private Hospitals:

A comparative analysis of HWM practices between government and private hospitals of Gujrat city based on primary data and visual examination is discussed in this section.

Waste which is produced in the government and private hospitals, usually collected by sweepers and waste collectors but unfortunately due to absence of proper dumping and storage area in government hospitals, waste is openly dumped into the open air which makes identical garbage heaps around hospital premises. TMA transported this waste to the final disposal sites after 3-4 days. However, in private hospitals due to strict management and regular monitoring by hospital administration, waste is properly stored for maximum 24 hours in the specific storage area. To keep this area protected from the access of scavengers, it is properly locked. This waste is regularly transported to the final waste disposal site by TMA. For infectious and hazardous waste treatment, incineration facility is available only in the government hospital 1, but this incineration plant has been un-operational since July 2013 due to lack of budget, high maintenance and operational charges, as well as lack of technical information etc. Therefore, to get rid of this waste, open burning is the final option for hospital administration. Although waste burning is prohibited due to its harmful environmental impacts, the practice is very common, especially in government hospitals. Due to high penalties for this criminal offence, private hospitals do not burn their waste. In private hospitals, infectious and hazardous waste is separately collected, stored and disposed of finally by TMA.

In government hospitals, needle cutting techniques are normally not applied due to the lack of needle cutters and unavailability of safety boxes. During personal visit to these hospitals,

researcher noticed many intact needles on garbage heaps which were collected by scavengers as a recyclable product. Pictures of un-cut needles are given in Appendix 3. However, in private hospitals, due to the superintendent regularly monitoring and the refresher of the training courses based on hospital waste management rules 2005, proper destruction of needles and other infected sharps is done by hospital staff including doctors, nurses and paramedics. For proper cutting of used needles, hospital administration provided at-least one needle cutter and safety box per ward. Initially, waste produced in hospital wards is collected in dustbins but researcher found that in government hospitals, the number of dustbins was insufficient, patients and their visitors were throwing their waste under their beds or around the hospital premises. When asked from the administration, they replied that due to lack of budget they could not buy a sufficient amount of baskets. On the other hand, in private hospitals, a sufficient number of dustbins are available. For proper collection of waste, hospital administration provided at least one basket to each bed wrapped with biodegradable plastics bags that make its bottom clean and prevent from ill-smelling in the ward. Pictures of dustbins with biodegradable plastic are given in Appendix 3. Due to lack of knowledge about color coding scheme, no segregation practice for paper, plastic, glass and other general waste was implemented in either the private or the government hospitals of Gujrat, City. Researcher found that in both government hospitals of Gujrat City, hospital administration do not provide protective measures including gloves, face masks, and safety shoes for the sanitation staff and waste handlers to prevent them from getting diseases especially during infectious waste handling. However, in the case of private hospitals, due to a proper waste management system and awareness regarding health impacts, hospital administration does not only provide protective measures but they even strictly apply these practices among their waste workers.

Although waste management regulations and the maintaining of proper records is on the responsibility of hospital administration (Rasheed et al. 2005), there is no documentation maintained due to lack of internal and external monitoring in either of the government hospitals of Gujrat city, whereas in both private hospitals there was complete documented compliance due to strict management system.

As mentioned before there are only two government hospitals in the city of Gujrat where there are around 50 private hospitals that have been established for commercial purposes. Therefore, there is tough competition among private hospitals to attract patients. To improve their business

private hospitals always try to provide better facilities for their patients by keeping the administration strict. The hospital administration strictly follow and implement the hospital waste management rules. Moreover, due to strict penalties enforced by government health departments, the administration of the private hospitals always try to keep the hospital area clean and keep proper documentation regarding waste management. Whereas in the case of government hospitals there is no proper waste management system due to the absence of a strict internal and external monitoring. Rules enforcement agencies and hospital administration get favors from each other so therefore, the implementation level of waste management rules is comparatively lower than in the case of private hospitals. Moreover, political interference in government hospitals is another hindrance to implement HWM rules. The medical and administrative staff at the government hospitals get access political authorities in case of any penalties imposed by the health department.

5.0 IMPACTS OF HOSPITAL WASTE ON THE HEALTH OF PEOPLE LIVING AROUND WASTE DUMPING SITE;SHEIKH SUKHA:

This chapter is based on the information collected through question guides from local people living around biggest waste dumping site of Gujrat city which is known as Sheikh Sukha. Researcher personally visited this site and collected the information through questionnaires regarding health issues caused by hospital waste. To get deeper knowledge about the Sheikh Sukha waste dumping site, researcher asked questions from local people living there since childhood or longer than 5years. The collected information regarding health impacts on the people of Sheikh Sukha caused by the open waste dumping is given below;

5.1 Background Information about Sheikh Sukha Waste Dumping Site:

Questions were asked from the village people as well as TMA staff about the reason the Sheikh Sukha land became a dumping site. The respondents from TMA told that initially, this land was purchased to install a fertilizer industry and there was no such proposal about open waste dumping. TMA representatives convinced the local people by saying that TMA would collect the solid waste from the city and this waste would be processed and used to make fertilizers in this industry. Moreover, this industry would bring employment opportunities for the local people but thereafter, no fertilizer industry was established and the site remained as open waste dumping

area. The people complained but TMA regularly started to dump waste openly without any collective decisions between TMA and local community. However, inhabitants formerly started protest and registered complaints against this illegal act but no action so far has been taken against TMA. TMA officials told that there is no other option and nor the TMA has any budget for shifting the waste to other place. The respondents in the village complained that the local political leaders are not taking interest in the solution of the issue.

5.2 Burning of Waste and Its Associated Diseases:

Akter (2000) reported that open waste burning at low temperature can release many toxic chemicals into the atmosphere, which may result in eye, skin, lung, heart and throat diseases. During this field survey, on asking about the burning of waste, people informed the researcher that this burning is mainly done by TMA workers to minimize the volume of this waste. Sometime also scavengers (Afghani refugees) and waste collectors burn this waste. Moreover, due to this waste, the community has faced many health issues and spread of diseases such as eye irritation and skin allergy, continuous headache, asthma, throat and lungs infection which have not existed before the open waste dumping and burning. Respondents also told the researcher that due to burning of this waste many diseases have been spread-out in their community but nobody noticed this issue. People complained that their family members, especially people of old age and children, have suffered continuous headaches, fever, eyes irritation, skin allergies, sore throat, asthma, breathing difficulties and many other diseases. During a conversation with a 43 year old man, he showed his affected arms (Pictures of his arms are given in Appendix 3) with serious skin allergy. He told the researcher that his wife and 6 year old child also have been suffering from skin allergy due to this waste burning. Another 35 year old woman informed the researcher that due to burning of the waste, her family had suffocation, sore throat and breathing problems for the whole day. Her father and mother-in-law have been suffering from asthma. During this field survey and conversation with local people it was also noted that people were aware that this open burning of waste contributes in air pollution which is a criminal offence. Unfortunately, government does not take any positive action to stop this violation. Mustafa et al. 2009 stated in IUCN (International Union for Conservation of Nature and Natural Resources) that open burning of garbage increases carbon emission which releases toxic compounds into the air and can cause air pollution and global warming.

5.3 Open Waste Dumping and Its Associated Diseases:

During the field visit and visual examination, researcher noticed that TMA vans were openly dumping waste on this site. Picture of TMA van and its open dumping is given in Appendix 3. Most of the respondents told to the researcher that everyone who is living around this site is completely against of this open waste dumping but unfortunately, this open dumping by TMA has been happening for the past 5 years. Almost each respondent reported that they are mentally and physically disturbed by this action. Out of 20 respondents, 12 mentioned that among their family members someone has suffered from Hepatitis C. The main reason that they mentioned was the drinking of polluted water which is mainly caused by the waste dumping and contaminate the ground water as well as water supply pipes. Another 6 respondents reported that in their family at least one member had been suffering from Dengue fever which is mainly caused by mosquito bites. One respondent told the researcher that last year his cousin died due to Dengue fever. Researcher also came to know that Malaria is a very common disease in this community especially during the monsoon. Respondents told that in rainy season, water gets mixed with this waste and becomes stagnant which improves the breeding of mosquitoes and flies. These mosquitoes are the main reason for the Malaria out-breaks. Moreover, this stagnant water emits an obnoxious smell and due to this smell, everyone suffers from severe headaches and dizziness.

5.4 Respondents Suggestions for Possible Improvements in Waste Disposal System:

During the information collection through question guides and direct communication with the local people, researcher also got some suggestions from them on how to improve the waste disposal system. Some suggestions and possible improvements are mentioned here.

The local people in the village who were interviewed suggested that rather than open waste dumping, land-filling option can be adopted with the help of government and NGOs working on environment and health. Local people together with the government and NGOs can purchase the land, and if government is not willing, the community itself can purchase on installment basis. The open waste can be removed from the area in the form of land filling system but the TMA should ensure that there is no more open dumping of the whole city's waste. Another respondent from the village suggested that installation of incineration plant is another robust option to

minimize the volume of the waste and after incineration process, the remaining ash can be disposed of at land filling sites. During a conversation with a TMA staff member he said that for organic waste treatment installation of composting plant is the best and less expensive option for government. By adopting this option, the huge amount of waste can be utilized for making fertilizers. By installation of the incineration or composting plants nearby the community could help to get rid of the waste and its associated diseases. Furthermore, job opportunities would be created for the local people.

A 40 year old man suggested that Malaria and Dengue are epidemic diseases with outbreaks due to mosquitoes attacking, especially in the rainy seasons. To protect from Malaria and Dengue fever, the open waste should be covered by soil or alternatively, the use of appropriate mosquito killing sprays could be beneficial for the surrounding community. During informal discussion many respondents from the village suggested that by making a wall around this waste dumping site, waste will not be spreading all around. Moreover, the movement of cats, dogs, and rodents will be minimized. TMA officials also agreed that by making a wall around this site, dumping of waste will be on an identical place as opposed to random places. Many respondents from the village were against the use of non-biodegradable plastics. Even TMA officials were agreed that these plastics should be strictly banned by the government of Pakistan because due to their non-degradable nature their life span is very high. A 35 year old woman from the village said that these plastics are openly burned by Afghani refugees with other wastes therefore producing many toxic gases and an obnoxious smell into the atmosphere which causes eye and skin allergy especially among children and older people.

Since 2005 Sheikh Sukha waste dumping site is the property of TMA and they have legal rights to dispose of all of the waste which is produced in the city. In this research work it has been noticed that people living around this waste dumping site has protested many times against this open waste dumping action. The respondents told that they have registered many complaints against TMA but due to lack of political leadership and government interest no action has been taken on their complaints. According to TMA due to lack of technical and economic resources, there is no any other available site to be reserved by the government for waste disposal.

6.0 CONCLUSIONS:

In Pakistan since 1998, hospital waste management guidelines and particularly Hospital Waste Management Rules, 2005 are existed but unfortunately due to unawareness and lack of strict hospital management, the level of implementation of these rules and regulation is very low. The overall objectives of the study was to find out hospital waste management practices in government and private hospitals of Gujrat city of Pakistan and to compare how private hospital waste manage was better than the government hospitals. To collect the information in terms of hospital waste management practices, qualitative methods were applied on two government and two private hospitals. Moreover question guide was used to collect the information regarding the impacts of hospital waste on environment and health of people especially living around Sheikh Sukha waste dumping site. This research found that in government hospitals the overall waste production is greater than private hospitals due to high number of patients visited per day. The calculations based on the formula taken from Ahmed (1997) shows that in government hospitals waste generation rate is 75kg/day whereas in private hospitals is 24kg/day. In government hospitals for the collection of waste common basket is used in each ward whereas in private hospitals each bed has its own basket wrapped with biodegradable plastics. In government hospitals after collection of waste by sweepers, it is openly dumped around hospital vicinity. After 3-4 days TMA collect this waste and transported for final disposal at Sheikh Sukha biggest waste dumping site of Gujrat city. Although incineration plant is available in one government hospital but due to its high maintenance and operational cost it is un-operational since July 2013. Therefore to get rid of infectious and hazardous waste "Open air Burning" is very common technique rather than incineration. Whereas in case of private hospitals after collection this waste is stored in a proper waste storage area, In addition for infectious waste rather than burning separate containers are primarily used to store then for final disposal regularly TMA collect and transported hospitals waste on monthly basis around 70-100 UD\$.

Therefore this research shows that the overall implementation level of HWM rules in terms of collection, segregation ,storage, disposal and transportation in private hospitals are much better than government hospitals due to their strict management and regular monitoring. Another reason is that due to various number of private hospitals, there is a tough competition among them.

Therefore to achieve their financial targets private hospitals always try to provide better medical facilities to their patients.

This research also revealed that TMA collect all of the hospitals waste and unfortunately mixed along municipal waste then finally disposed of at Sheikh Sukha waste dumping site without considering its health and environmental consequences. The findings of this research illustrated that some chronic diseases such as headache, fever, skin allergies, eyes irritation and Hepatitis C are very common especially among those people living around the waste dumping sites because of open waste dumping. Due to lack of proper solid waste management system ground water is contaminated therefore by drinking of polluted water Hepatitis C is very common in this region. In addition due to open burning of this waste asthma, lungs infections, sore throat, eyes irritation and skin allergies were noticed especially among children and old age people.

Therefore based on this research findings there is an urgent need to create awareness about hospital waste management practices in terms of its collection, segregation, storage, transportation, waste minimization, reuse and final disposal. Hospital administration should strictly focus on health education and intensive training of color coding scheme especially among hospital and sanitation staff. In addition ministry of health should strictly enforce penalties on the offenders of HWM rules. Proper documentation of hospitals waste production is very important for future planning. This research also suggested that rather than open burning and mixing of infectious waste with municipal waste "Incineration" practices should be adopted. Moreover for municipal waste TMA should focus on installation of composting plants and land filling techniques.

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APPENDIX 1:

Interview: Hospital waste management in the city of Gujrat, Pakistan

General Information:

Hospital name: -----

Department: -----

Interviewee name (Optional): -----

Occupation: -----

Gender: -----

Hospital waste management:

1. What types of hospital waste are produced in this hospital?

2. How much (kgs) hospital waste is being generated in this hospital per month?

3. Which method is used for the treatment and disposal of hospital waste?
Please specify each method of treatment.

4. By whom and how this waste is being collected within hospital?; Local Government, Health care facilities, scavenger or any other?

5. Where is this hospital waste being disposed of?

6. How often is the waste being collected and transported? (regularly, weekly or monthly?)

7. What is the average cost of treatment and disposal of waste per month?

8. Is there any recycling practice in this hospital? If yes, then which items are recycled?

9. At which time and who collects the recyclable products from the hospital?

10.How the recyclable products are treated outside the hospital?

11.Does this hospital has waste management team, If yes how many people comprising in this team?

12.How does this hospital follow government's waste management policy?

13.Please describe this hospital's waste management policy, If any?

14.Does hospital administration keep monthly record of waste management?

15.To what extent are you satisfied with the waste management?

16. What are the main weaknesses in the current medical waste management system?

17.How does medical waste affect health of local people?

18.What sort of complications are involved in managing the hospital waste?

19. Which hospital has better medical waste management system? Government or private hospital?

20. What measures would improve waste management system in government hospitals?

Thanks!

APPENDIX 2:

Question Guide

Impacts of Waste on The Health of People Living Near Sheikh Sukha Dumping Site:

General Information:

Name: -----

Age: -----

Occupation: -----

Gender: Male Female

1) For how long are you living near this waste dumping site?

Less than 1 year 2 year 3 years more than 5 tears

2) How many people are living in your household?

1 2 3 4 More than 4

3) How much population of this dumping area?

Less than 5 thousands More than 5 thousands Less than 10 thousands
 More than 10 thousands

4) How long this area is used for waste dumping?

Less than 1 year 2 years 3 years More than 3 years

5) Do you have health insurance?

Yes No

6) Do you wish to move to any other place?

Yes No

7) Does the government offer you any alternative place to live in?

Yes No

8) Do you have any kind of allergy problem due to this waste?

Yes No

9) *Does anyone in your family have any eye disease?*

Yes No

10) *Does anyone in your family have any skin diseases?*

Yes No

11) *What illness do you have due to this waste?*

Diarrhea Fever typhoid Others diseases..... No disease

12) *Does anyone in your family have any of the following infectious diseases?*

HIV-AIDs Hepatitis Malaria Dengue fever others

13) *Has EPA ever monitored hospital waste at this dumping site?*

Yes No Don't know

14) *Does TMA properly treat hospital waste before or after dumping of it?*

Yes No Don't know

15) *Does anyone burn the medical waste, if yes then who does?*

TMA Hospital workers Local people Scavengers No one burns

16) *Do you think land-filling is a big threat for public health?*

Yes No

17) *Do you suggest any alternative method of disposing of waste other than dumping?*

18) *Will you suggest possible improvements in waste management system?*

Thanks!

APPENDIX 3: Pictures of Hospitals Waste collection, Segregation, Storage and Dumping Area

Waste Management in Government Hospital 1



Open-air waste storage near Incineration Plant behind the building



Segregated infectious waste



Color coding containers with mixed hospital waste.



Open-air burning of hospital waste behind building.



Dispersed syringe without discarded/cut



Segregated injection bottles with syringes



Common bins used for the collection of all types of hospital waste

Waste Management in Government Hospital 2



Hole used for burial of hospital infectious waste



Trolleys used for waste transportation



Common bin used for all types of hospital waste storage



Blue color container used for hospital waste

Waste Management in Private Hospital 1



Separate dustbin for each bed wrapped with biodegradable plastic



Blue color container/drum used for storage of all types of hospital waste

Waste Management in Private Hospital2



Common bin wrapped with biodegradable plastic



Buckets used for collection of paper only



Common bucket used for collection of waste



TMA trolley used for storage and transportation of hospital waste

Sheikh Sukha Waste Dumping Site in City of Gujrat



TMA van openly disposing of waste



Waste attracting bats, crows and vultures



A man is showing his infected allergic hands due to open waste dumping



A man is collected recyclable products from garbage heaps



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