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Hospital Waste Management Rules 2005 and Current Practices in Selected Hospitals of Peshawar Khyber Pakhtunkhwa, Pakistan

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International Environmental Studies

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By

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Ås, Norway

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Declaration

I, Abdul Basit Khan Dawar, declare that this thesis is a result of my research investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously published and submitted to any other university for award of any type of academic degree.

Signature……...

Date……

To my dear parents and siblings who remember me in their prayers.

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Abstract

Within the scope of the study, the current situation and management practices regarding healthcare waste such as waste generation, segregation, on-site and off side collection and transportation, storage, and disposal were examined. Moreover, this study analysed the implementation status of hospital waste management (HWM) rules 2005 in both public and private hospitals also discussed the overall causes of malpractices of waste management as well as factors contributing to better healthcare waste management particularly in the private hospitals of Peshawar, Khyber Pakhtunkhwa. Qualitative research method was used for this study. In total, forty-four interviews were conducted in selected public and private hospitals equally, of which thirty-seven were semi-structured interviews and remaining seven were informal interviews. The study found the improper applications, inconsistencies, and deficiencies in the whole system of the waste management. The limited knowledge of hospital waste management rules 2005 particularly among nurses, paramedics, waste handling staff and administration in public hospitals was a serious concern. Lack of proper and simple monitoring and supervision system has further exacerbated the situation. Similarly, the limited scope and complicated nature of the regulations in hospital waste management rules 2005 makes the compliance challenging. Based on the evaluation of hospital waste management (HWM) rules 2005 and comparison of the current practices in both public and private sectors, changes and amendments in the healthcare waste management legislation and the reasons for the gaps between the public and private sectors were identified. These include the revision of legislation section No.4 to section No.14 and similarly section No.23 and section No.24 to make the rules practically implementable in both public and private sectors. The findings should be a good basis for making improvements in the management of healthcare waste in Peshawar as well as in Khyber Pakhtunkhwa.

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Abbreviations

HWM	Hospital Waste Management
HCWM	Healthcare Waste Management
WHO	World Health Organization
PEPO	Pakistan Environmental Protection Ordinance 1983
EPA	Environmental Protection Agency
PEPA	Pakistan Environmental Protection Act 1997
AIDS	Acquired Immune Deficiency Syndrome
HIV	Human Immunodeficiency Virus
TMWCR	Turkey the Turkish Medical Waste Control Regulation
NMBU	Norwegian University of Life Sciences
WSSP	Water and Sanitation Services Peshawar
PPE	Personal Protection Equipment
Govt	Government
Pvt	Private
PMDC	Pakistan Medical and Dentistry Council
EPT	Environmental Protection Tribunal

1. Introduction

Mismanagement of healthcare waste is a significant problem in developing countries. Healthcare waste has not received adequate attention even though it is labelled as hazardous or infectious waste (Alagöz et al. 2008; Da Silva et al. 2005; Jang et al. 2006; Tsakona et al. 2007). Healthcare waste is a by-product of healthcare activities that includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices, and radioactive materials (Morales 2013). Society for Hospital Epidemiology of America (SHEA), defined it as "materials generated as a result of patient diagnosis, treatment, or immunization of human beings or animals"(Martini 1993: 208). The American Environmental Protection Agency (EPA**),** defined medical waste as "any solid waste which is generated in the diagnosis, treatment,' or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biologicals" (ibid). Healthcare waste management (HCWM) in the world is a formal discipline and does occupy a significant place in the management of the healthcare sector. The proper management of hospital waste requires that segregation, on-site collection and transportation, storage, incineration, off-site collection and transportation and final disposal of waste from all healthcare facilities should be done as safely, hygienically, and economically as possible and all stages should also minimize the risk to public health and the environment.

Most of the developed countries follow the standard guidelines of World Health Organization (WHO) in managing their health care waste. United States, Canada, and the United Kingdom have a standard legislation and implementation of health care waste management (Windfeld et al. 2015). Some developing countries lack specific laws and regulations of health care waste management and others have basic regulations to manage healthcare waste but do not follow the standard World Health Organization (WHO) guidelines. In South Asia "Nepal, Bangladesh, and Maldives have no legislation guidelines at all while in Bhutan and Sri Lanka basic guideline exists" (Hassan et al. 2012: 1786). Pakistan also has basic legislation of health care waste management but it does not meet the World Health Organization (WHO) standard. Pakistan has the basic legislation in form of hospital waste management (HWM) rules 2005, but they are hardly implemented. Consequently, mismanagement of hospital waste poses risks to human health and the environment. Hospital staff, patients, waste handlers, scavengers, and the public in general are exposed to health risks from infectious healthcare waste (especially sharps) (Johannessen et al. 2000). Improper disposal of infectious, injurious, and toxic healthcare waste, "including open dumping and uncontrolled burning, increases the risk of

spreading infections and of exposure to toxic emissions from incomplete combustion" (Johannessen et al. 2000: 1).

Considering this issue as a major concern, many researchers in developing countries have studied the existing healthcare waste management (HCWM) status, practices, and issues in selected healthcare facilities within their countries and have mentioned different reasons for poor hospital waste management status and practices in their publications, see for example (Bdour et al. 2007; Coker et al. 2009; Da Silva et al. 2005; Hassan et al. 2008; Kumar et al. 2010; Marinković et al. 2008; Nemathaga et al. 2008; Pescod et al. 1998). Similarly, for example, Sharma and Chauhan, in their study from India shows that lack of finances, proper hospital management teams, equipment, and concern are the major problems in this life sensitive issue (Sharma et al. 2008). Study from Bangladesh shows lack of awareness among hospital staffs (Nurses, lab technicians, and *aya's* (maids') including high officials and waste collectors regarding safe disposal and handling of hospital waste (Akter 2000). A study from Turkey shows lack of sufficient budget allocation from government, lack of awareness and training, and high expense of treatment/disposal (Alagöz et al. 2008). "Compliance with regulations or guidelines by many healthcare facilities remains a problem in all countries due the lack of proper enforcement regimes" (de Titto et al. 2012: 560).

Today the proper healthcare waste management (HCWM) system covers segregation at the point of generation, on-site collection and transportation, storage, incineration, off-site collection and transportation and final disposal. Medical waste and its management were not generally considered an issue until late 1970's. The US recognition of medical waste as a separate waste within the municipal waste and in 1980s and 90's, concerns about exposure to human immunodeficiency virus (HIV) and hepatitis B virus (HBV) led questions about potential risks inherent in medical waste (Arshad et al. 2011). "According to a World Health Organization (WHO) assessment there were about 22 countries in 2002 which had about 64% hospitals with no proper waste disposal methods" (Kumar et al. 2010: 101). Hospitals generate the toxic and nontoxic waste worldwide but it became a major challenge to the developing countries.

In Pakistan, there are perceptions about public and private hospitals that all type of waste, including infectious, general, and biological materials are all mixed together and are collected, transported, and finally disposed together. Some evidences show that private hospitals are better than public hospitals with the overall compliance of healthcare waste management

(HCWM) rules and practices. Studies in Pakistan, show many reasons for the poor hospital waste management status and practices such as: lack of awareness of hospital staff, lack of interest of hospital staff to follow and administration to implement the rules, lack of proper supervision, no special or separate department for waste management within hospital and lack of finances (Abbasi 2014; Ali et al. 2015; Ansari et al. 2013; Arshad et al. 2011; Kumar et al. 2010; Mahwish et al. 2013).

Rapid population growth and urbanization in Pakistan increased healthcare needs, which originate expansion of different facilities to provide healthcare services, such as government and private hospitals, clinics, and laboratories. Thus, different type of hazardous, toxic, and infectious waste, such as biological waste, chemical and drugs, radioactive waste, are produced. These types of waste have a potential risk to environment and human health. Hospital waste has a special importance in waste management system due to the existence of environmental and human hazardous. Environmental pollution caused by inefficient management of hospital waste, such as, air pollution, land and water pollution, unpleasant odour, propagation of insects (flies, mosquito, and worms), and transmission of human diseases, cholera, typhoid, hepatitis B, hepatitis C, and HIV/AIDS.

Hospital waste management and safe disposal in each country depends upon several factors including sensitization level of the health administration, managers and hospital staff, existing local legislation of healthcare waste management, and available resources. In Pakistan, due to many reasons, neither proper hospital waste management systems have been developed nor are the concerned healthcare administration, professionals and managers aware of the importance of the situation resulting within (Arshad et al. 2011). In today's world, different methods are being used to dispose separate waste of the healthcare waste i.e. on-site incineration, steam disinfection, microwave disinfection, autoclave disinfection, and chemical/mechanical disinfection. In Pakistan, like other developing countries, three kinds of methods are being used for disposal of the healthcare waste, i.e. incineration, landfills, and open dumping. Neither a single landfill is constructed on scientific lines nor the incinerators installed at various places have proper filters and scrubbers accept some hospitals (Arshad et al. 2011).

1.1 Research objectives

Peshawar is the provincial capital city of the Khyber Pakhtunkhwa Province. Peshawar has major and well-known public as well as private hospitals. During the past one decade, several studies addresses various reasons and impacts of hospital waste management on human health and environment, but there is a lack of studies looking at the management status of hospital waste, practices, and issues responsible for the gaps between public and private hospitals. This study will be based on the above mention evidences to study the current practices and implementation status of hospital waste management (HWM) rules 2005, the reasons for the better hospital waste management (HWM) in private hospitals as compare to public hospitals, and the overall reasons of miss-management and malpractices. Addressing the below research questions (RQ's) will play a vital role in awareness and education of hospital staff and public in general regarding the hospital waste management from generation to final disposal. It will helpful for the legislative authorities to make necessary changes/amendments in the present hospital waste management rules, addition, or subtraction based on ground realities to meet with the World Health Organization (WHO) guidelines and standard. It will also be helpful to the hospital administration for implementation of hospital waste management (HWM) rules 2005 and monitoring within hospitals. The successful implementation of hospital waste management (HWM) rules will also decrease the risk to public health and environment.

1.2 Research Questions

The following research questions (RQ's) asks to address the objectives of this study.

RQ 1: What are the current practices and implementation status of hospital waste management (HWM) rules 2005?

RQ 2: What are the main reasons of overall mismanagement and malpractices of healthcare waste management?

RQ 3: What are the reasons for better healthcare waste management (HCWM) in private hospitals as compare to public hospitals?

1.3 Structure of the thesis

The thesis consists of six main chapters. After the *Introduction* follows a *Background chapter,* it provides information on healthcare waste management both globally and in Pakistan. *Chapter 3 Conceptual framework,* presents analytical discussion for analysis and discussion of the conducted study. *Chapter 4 Methodology,* defines approaches and the methods applied in the study design and data collection during field work. *Chapter 5 Analysis and Discussion*, highlights the outcome of research study, divided into four parts. The first part describes the current practices, the second part discuss the implementation status of hospital waste management (HWM) rules 2005, the third part presents the overall reasons of mismanagement and malpractices of healthcare waste and the last one illustrate the reasons of better healthcare waste management in private hospitals as compare to public hospitals. *Chapter 6 Conclusion*, outlines some key findings and further study recommendations.

2. Background

This chapter discussed the background of healthcare waste management (HCWM). I tried to discuss the definition of healthcare waste, categorization, global generation rate, management practices of waste in developing countries including Pakistan, hospital waste management (HWM) legislation in Pakistan and consequences of poor or improper management of hospital waste. Healthcare waste management (HCWM) is a burning global issue, particularly in developing countries including Pakistan. In the light of this background I tried to highlight the relevant information available globally as well as in Pakistan.

2.1 Healthcare waste

Healthcare waste refers to all kind of wastes, biologic, and non-biologic that is discarded and not intended for further use. Rutala and Mayhall (1992) says, generally there are four terms used: hospital waste, medical waste, regulated medical waste and infectious medical waste, when discussing hospital waste and all are often used interchangeably, with no universally accepted definition for each term (Rutala & Mayhall 1992; Windfeld et al. 2015). Hospital waste definition vary from region to region and country to country. In today's world, “there is no globally agreed upon definition of medical waste, which poses a challenge from a comparative standpoint, as changing definitions make a meaningful comparison between countries, or even between regions within countries, quite difficult” (Windfeld et al. 2015: 99). “There are currently no European regulations that define the concept of medical waste and offer clear guidelines for its effective management. As an orphaned sector of waste management, medical waste has been incorporated into the general waste legislation framework, as merely another type of waste” (Insa et al. 2010: 1049).

However, in this study the World Health Organization (WHO) concept of definition and waste management is considered as standard. The World Health Organization (WHO) defines the term healthcare waste, “includes all the waste generated within health-care facilities, research centres and laboratories related to medical procedures. In addition, it includes the same types of waste originating from minor and scattered sources, including waste produced in the course of health care undertaken in the home (e.g. home dialysis, self-administration of insulin, recuperative care)” (Prüss et al. 2014: 3). According to World Health Organization (WHO) 75% to 90% of the waste produced by healthcare providers/facilities is comparable to

domestic/general waste and usually called non-hazardous or general healthcare waste (Prüss et al. 2014). The general waste mostly comes from the administrative, kitchen and housekeeping functions at hospitals, include cardboards and packaging waste and waste generated during maintenance of hospital buildings. "The remaining 10–25% of healthcare waste is regarded as "hazardous" and may pose a variety of environmental and health risks" (Prüss et al. 2014: 3) and further explain that "infectious (hazardous healthcare waste) are 10%, Chemical/radioactive (hazardous healthcare waste) 5%, and General (non-hazardous healthcare waste) 85%" (ibid). Hospital waste management requires specific knowledge and regulations due to the potential of high risk to human health and environment.

2.2 Classification/Categories of healthcare waste

World Health Organization (WHO) classified healthcare waste in two major categories, non-hazardous waste, and hazardous waste. Hazardous waste is sub-classified in to different categories, sharp waste, infectious waste, pathological waste, cytotoxic waste, pharmaceutical waste, chemical, and radioactive waste.

Table. 1: Categories of healthcare waste

Waste category	Descriptions and examples
Hazardous healthcare waste	
Sharps waste	Intravenous and other needles, disposable syringes, OT's scalpels, infusion sets/tubes, Saws & knives, surgical blades, surgical scissors, and broken glass vials.
Infectious waste	Waste and cotton contaminated with blood, body fluids, tissues and organs, bandages and dressings, laboratory cultures, microbiological stocks, urine bags, blood bags.
Pathological waste	Human tissues, organs, body and blood fluids, body parts, foetuses, unused blood products
Pharmaceutical waste	Expired pharmaceutical products, contaminated pharmaceutical products, surplus and unused drugs, and vaccines.
cytotoxic waste	Cytotoxic/Cytostatic drugs, urine or vomiting from patient treated with genotoxic drugs and chemicals.
Chemical waste	Laboratory reagents (diagnostic chemicals), film developer; disinfectants, housekeeping solvents, heavy metals waste (Cadmium) e.g. batteries, Mercury from broken thermometers.
Radioactive waste	Included radioactive substances such as used and unused liquids from radiotherapy and laboratory research, contaminated glassware, packages, and absorbent papers with radio nuclides.
Non-hazardous/ general waste	Paper, cardboard, packaging, food waste, tins/cans, plastic bags and bottles, x-rays sheets, kitchen waste.

Note: Source of table (Prüss et al. 2014).

2.3 Global generation rate of healthcare waste

Many research studies confirm that developed countries generate higher amount of healthcare waste than developing countries (Marinković et al. 2008; Nemathaga et al. 2008). The globally waste generation rate in different developed and developing countries are discuss in detail below.

According to World Health Organization (WHO) “USA produces 7–10 kg of healthcare waste per bed/day” (Hossain et al. 2011: 757). The Western Europe produce 3–6 kg of hospital waste per bed/day (ibid). In Greece total 8.4 kg of healthcare waste is produced per bed/day in which 1.4 kg is infectious waste and 7 kg is municipal waste (Tsakona et al. 2007)."In teaching hospitals in Europe the generation rates were 3.9 kg/bed/day in Norway, 4.4 kg/bed/day in Spain, 3.3 kg/bed/day in UK and France" (Bdour et al. 2007 .750). The results of the field research conducted in Turkey shown, “the average solid and health-care waste generated from the hospitals is about 5 kg/bed/day” (Alagöz & Kocasoy 2008: 1230). The healthcare waste generation rate in Jordan have been estimated 3.49 kg/bed/day, 3.14 kg/bed/day and 1.88 kg/bed/day for public, teaching and private hospitals, respectively (Bdour et al. 2007). In India, normally 1 to 2 kg of waste per bed/day have been measured (Agarwal 1998). One other research study from India shows that “the waste generation rate ranges between 0.5 and 2.0 kg per/bed/day” (Patil & Shekdar 2001: 211).The study result from Ghana shows that total 8221.2 kg/day of hospital waste are generated from 6851 beds, which make 1.2 kg/bed/day (Asante et al. 2013). The quantity of medical waste generation from the surveyed hospitals in Egypt, results the range between 0.23 and 2.07 kg/bed/day (El-Salam 2010: 620).“In Bangladesh, the medical waste generation rate is estimated to be 0.8 to 1.67 kg/bed/day” (Syed et al. 2012: 141).A research study from Brazil shows that "average generation rates of total and infectious-biological wastes in the hospitals were estimated to be 3.245 and 0.570 kg/bed-day, respectively" (Da Silva et al. 2005: 600). In Pakistan "around 2.0 Kg of waste/bed/day is produced out of which 0.1-0.5 can be categorized as risk waste" (Arshad et al. 2011: 1413). From the available healthcare waste management (HCWM) data, it is evident that amount of hospital waste generation rate depends on the level of economic development of the country and region.

Table. 2: Generation rate and comparison of healthcare waste and healthcare system ranking

Country	Infectious waste generation (kg/bed/day)	Total healthcare waste generation (kg/bed/day)	WHO ranking of health system performance
Bangladesh	N/A	1.67	88
Brazil	0.570	3.245	125
Canada	N/A	4.1	30
Egypt	N/A	2.07	63
France	N/A	3.3	1
Ghana	N/A	1.2	135
Greece	1.4	8.8	14
India	N/A	2	112
Norway	N/A	3.9	11
Pakistan	0.5	2.07	122
Spain	N/A	4.4	7
Turkey	N/A	5	70
United Kingdom	N/A	3.3	18
United States	2.79	10.7	37

Note: Data for WHO ranking of health system performance in the world (WHO 2013)

2.4 Healthcare waste management (HCWM) regulations and guidelines

Rapid population growth and urbanization of human societies increased healthcare needs, which caused expansion of different facilities to provide healthcare services, such as government and private hospitals, public and private clinics, blood banks, and laboratories. Thus, different types of hazardous, toxic, and infectious waste such as biological, non-biological, chemical, and radioactive waste are produced. In the late 1970's, America recognise medical waste as a separate waste category within the municipal waste, when medical wastes including syringes and bandages were washed up on the eastern coast beaches of US (Agarwal 1998: 4). The public objection which led to the formulation of the US Medical Waste Tracking Act (MWTA) came into force on November 1, 1988 (ibid). "After several years work the WHO in 1999 published the first comprehensive handbook on the subject, *Safe Management of Wastes from Healthcare Activities*" (de Titto et al. 2012: 559). This publication was followed by International Solid Waste Association (ISWA) Teachers Guide: *Training Resource Pack*

for hazardous waste management in developing economies published in 2002, for training purposes and was found to be most useful in training staff by low and middle income countries (de Titto et al. 2012). The World Health Organization (WHO) comprehensive handbook known as "Blue Book" on the subject, *Safe Management of Wastes from Healthcare Activities* had been revised to bring up to date and published in 2014.

World Health Organization (WHO) also introduces some core principals in the shape of recommendation to achieve safe and sustainable management of health care waste. “The WHO core principles require that all associated with financing and supporting health-care activities should provide for the costs of managing health-care waste. This is the duty of care. Manufactures also share a responsibility to take waste management into account in the development and sale of their products and services” (WHO 2007: 1). One reason behind that core principals were the alarming situation of health in the world in 2000, World Health Organization (WHO) estimated that injections with contaminated syringes caused 21 million hepatitis B virus (HBV) infections (32% of all new infections), two million hepatitis C virus (HCV) infections (40% of all new infections) and 260000 HIV infections (5% of all new infections) (WHO 2007).

2.5 Healthcare waste management (HCWM) practices in developing countries

“There is no proper waste management system in place in most developing countries” (Akter 2000: 12). Waste management in developing countries are usually delegated to ordinary workers and they do more things without proper instructions and insufficient support (Diaz et al. 2005). Different researches studies from developing countries show that the hospital waste is managed in an inappropriate manner. The study conducted in India shown malpractices of hospital waste. There are found no proper segregation, collection, and on-site transportation of waste. The most common final disposal methods of the medical wastes are incineration and open burning in some corner of the hospitals grounds. The “smaller private nursing homes and clinics do not take any precautions and often dispose of their waste in the community bins intended for storage of municipal solid waste” (Patil & Shekdar 2001: 213).

In Bangladesh, there are no proper, systematic management of medical waste except in a few private healthcare establishments that segregate their infectious wastes. Some cleaners were found to collect/recover used sharps, saline bags, blood bags, and test tubes for resale or reuse

(Hassan et al. 2008). Beside incineration the medical facilities use a variety of methods to dispose of healthcare wastes. “These included burning, burial, selling, dumping, reuse and removal by municipal bins” (Akter 2000: 7). The medical waste disposal practices at government hospitals and clinics, private clinics and laboratories are to collect all wastes together and dump in a common place, “those places were roadside, hospital surroundings, dustbin of city corporation, Corporation’s drum” (ibid).

Iran does not have any proper system for hospital waste management (HWM). The hospital staff do not practice proper segregation of the waste and collection is done in two stages: First, gather at the hospital to transfer to a temporary storage area and then transferred from temporary storage area to permanent disposal location. One of the most common methods of removing infectious hospital waste which has been used for many years in Iran was installation of Incinerators but more recently, through the Ministry of Health and Medical Education, Autoclave is proposed for disinfecting healthcare wastes and many of them have been installed in hospitals across the country. Motor Services Organization of Tehran Municipality is responsible for collection of hospital waste from both public as well as private sector (Teimori et al. 2014).

In Jordan “poor segregation and classification procedures of the generated wastes are noticed at all surveyed hospitals and medical laboratories” (Bdour et al. 2007: 751). It has also been reported that workers mix segregated hospital waste as they collect waste for external storage, or that municipal workers mix the different types of waste together during collection. All the hospitals practice open-dumping or follow inadequate land filling procedures for final disposal of healthcare wastes (Bdour et al. 2007). The poor healthcare waste segregation and handling practices has been observed in Cameroon. The sanitation workers and nursing assistants are responsible for collection and transportation of waste within the hospitals but found poor handling practices by this group of workers. The most common final disposal practices of hospital waste “are dumping in uncontrolled and poorly designed landfills and dump sites as well as incineration with inadequate measures to deal with emissions to air, soil, and water” (Manga et al. 2011 .115).

According to Ghana Health Services (2006), colour coding of waste containers and plastic bags (Black for general waste, Yellow for infectious waste and Brown for hazardous waste) be used to facilitate efficient segregation of healthcare wastes, but unfortunately, “none of the 120 healthcare centres (involved a teaching hospital, specialist’s hospitals, General hospital, clinics and herbal hospitals) visited were using these colours for their bins or carrier bags” (Asante et

al. 2013; Asante et al. 2014 .109). The collection practices and vehicles used for transportation of waste were inadequate. “The study also showed that, just about five healthcare centre use incineration mode of treatment. Almost all the other healthcare facilities uses open burning, and land filling mode of treating solid waste and open gutter dislodging for the liquid healthcare waste” (Asante et al. 2013; Asante et al. 2014 .110).

The study done in Brazil, show that the healthcare facilities demonstrate a priority on segregation of Group A wastes, i.e. sharp wastes (SW) and bio-hazardous wastes (BHW) at the point of generation. Hazardous wastes (Group B) have not received the proper amount of attention in all healthcare facilities (Public hospitals, Private health centres and Clinical laboratories) and because of the lack of Group B waste segregation practices in most healthcare facilities, many of these hazardous materials are mixed into general solid waste (Group D) for disposal in municipal bins or are mixed with other infectious wastes. It has also been reported that the cleaners and nursing assistants together mix segregated wastes as they collect and transport them for external storage or the municipal employees mix them together during collection. There are two kinds of methods are in practice for infectious and hazardous waste treatment; incineration, and buried in small cells (medical waste landfill) without preliminary treatment (Da Silva et al. 2005).

2.6 Healthcare waste management (HCWM) legislation in Pakistan

Unlike other developing countries (Nepal, Bangladesh, and Maldives), Pakistan has basic legislation of healthcare waste management (HCWM). Between the previous three decades, the legislative and regulatory framework has marginally improved. Pakistan Environmental Protection Ordinance (PEPO) 1983 was the first regulatory framework which aims; to establish federal and provincial Environmental Protection Agencies (EPA’s) and Pakistan Environmental Protection Council (PEPC), but lack of any specific rules for healthcare waste management. The Pakistan Environmental Protection Act 1997, is the amended version of Pakistan Environmental Protection Ordinance (PEPO) 1983, and probably the most comprehensive statute that provides legal umbrella cover to activities of environmental management including healthcare waste management (HCWM) domain. “The Pakistan Environmental Protection Ordinance (PEPO) 1983, provides the legislation to control environmental pollution in Pakistan but does not specifically mention healthcare wastes,

whereas PEPA, 1997, which supersedes PEPO, 1983, defines hospital waste and deals with the handling of hazardous substances" (Pescod & Saw 1998 .3).

In addition, the Federal Ministry of Health issued healthcare waste management (HCWM) regulations in 1999 with an advice to all healthcare facilities for compliance of the same. On 3rd August 2005, under the provision of Pakistan Environmental Protection Act (1997), section 31, Federal Ministry of Environment issued notification, to add the new rules for hospital waste management (HWM) as standard. In notification, it is said that these rules may be called the Hospital Waste Management (HWM) Rules 2005 and shall come into force at once (FMOE. 2005). Detailed information and covering all aspects of safe hospital waste management (HWM) in the country is provided, including formation of a waste management teams in hospitals and their responsibilities, methods of collection, segregation, transportation, storage and disposal, containers and their colour coding, identification of risk associated with the waste etc. (FMOE. 2005).

2.7 Healthcare waste management (HCWM) practices in Pakistan

The different research findings show that most of the public and private hospitals do not practice proper healthcare waste management (HCWM) in Pakistan as defined by the government. The study conducted in eighteen different hospitals (Khyber Pakhtunkhwa, Punjab, and Islamabad) results in improper segregation and partial use of colour codes for different types of waste. The incineration was the most common method for infectious waste disposal while burning was the second preferred option being used (Hassan et al. 2012). In the city of Quetta "the management at most of the hospital exhibited a careless attitude and the collection, handling, transfer and transport to the final disposal site is being conducted in the most hazardous manner" (Zafar et al. 2013: 102). The waste handling staff of the hospitals were not trained and equipped and do not realize the associated health risk with the infectious waste. For the final disposal two methods were used incineration and dumping in landfill (Zafar et al. 2013). Some of the malpractices in different eight teaching hospitals in Karachi includes; non-existence of waste bins in the wards/bed side spaces, unsatisfactory segregation of infectious waste, improper on-sit collection and transportation by sweepers, absence of noted storage points, and usage of wheel chairs/stretchers/ambulances for waste transportation. For final disposal of the waste two kinds of treatment methods were used; incineration and dumping

in municipal landfill sites. The city district government Karachi was responsible for off-site transportation and final disposal (Rehan et al. 2008).

The research study conducted by Mahwish et al. in both public and private hospitals in different cities (Islamabad, Karachi, Lahore, and Khyber Pakhtunkhwa) of Pakistan, illustrates that the generated waste were keep mix in one small basket placed under each bed, colour coding was absent, no proper collection and transportation were observed and "the only exceptions were blood products and placentas, which were stored separately and were later taken away by a governmental agency for disposal" (Mahwish. et al. 2013: 13). The most prevalent type of waste treatment was observed as incineration and open burning and finally the waste disposed together with general waste in the open disposal site. The result of the study also confirms that "the situations in the private health care establishments are comparatively better than the government hospitals" (Mahwish. et al. 2013: 14).

2.8 Consequences of improper healthcare waste management (HCWM)

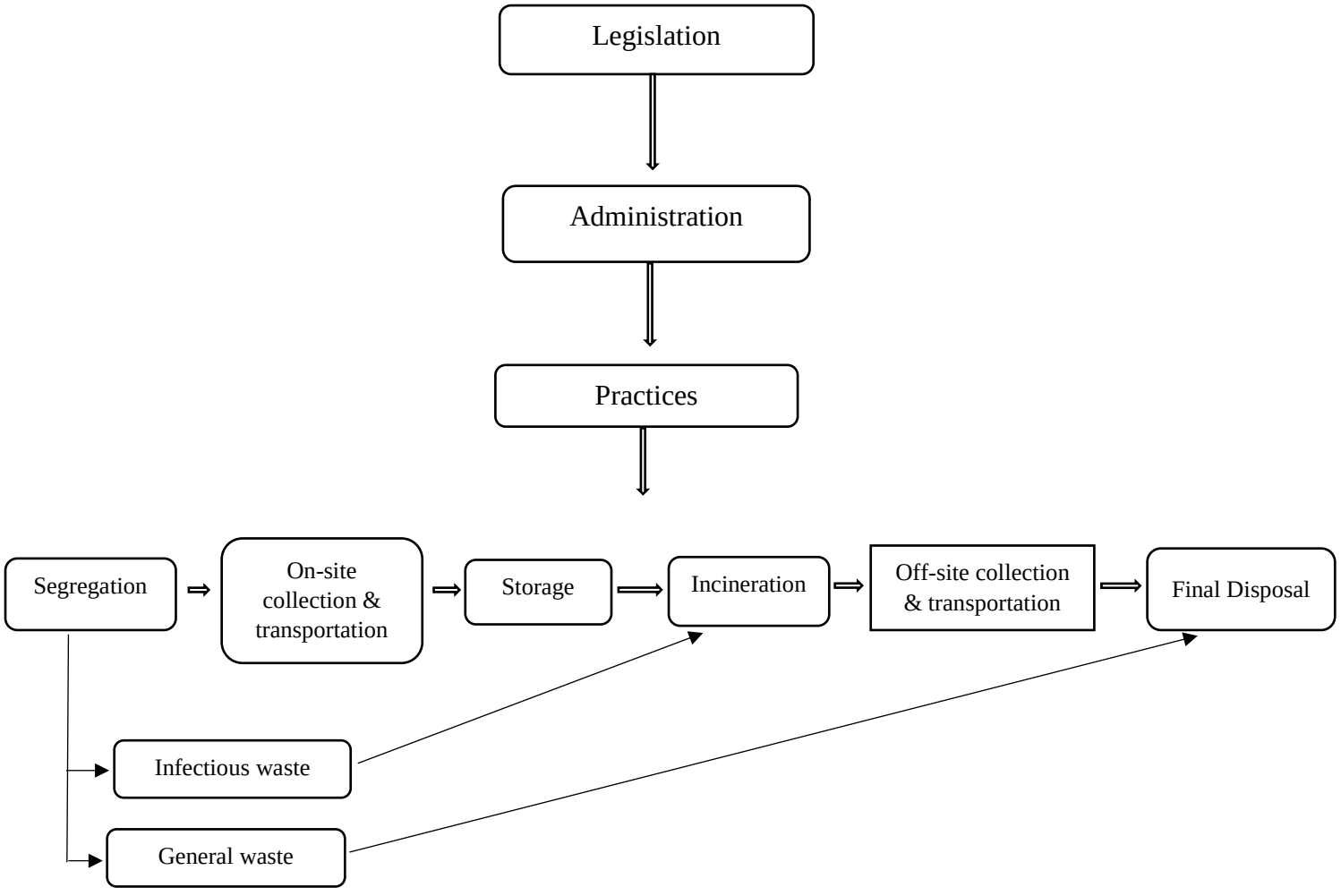
The improper healthcare waste management (HCWM) not only threaten human health directly by causing various deadly diseases and injuries but also causing environmental pollution. Those individuals who are directly exposed to hospital waste are potentially at health risk such as the people belonging from medical profession (Doctors, Nurses, Laboratory Technician, paramedic staff), waste handler (sweepers, sanitary workers, housekeepers, ward boys), patients in the hospital, visitors to the hospital, support workers (laundry and transporters), workers in landfills, incinerator operators, and scavengers. The stray animals and birds are also at risk and can spread diseases (Rasheed et al. 2005). The malpractices of hospital waste are results in transmission of numerous diseases, in which Hepatitis B, Hepatitis C, and AIDS/HIV are most common. The disposal of healthcare waste, especially hospital water without prior treatment directly into sewerage water cause pollution and contamination of water resources as well as affect aquatic flora and fauna. The decomposed hospital waste cause bad smell and visually looks unattractive. The indiscriminate disposal of hospital waste and water directly into water resources contribute immensely towards the pollution of river and sea which directly affecting the fisheries potential, mullet, sea breams, shrimps and other bottom fishes of the creeks and harbour (Ahmed 1997). "The poultry feed is also prepared from the marine waste which directly affects the food chain of the citizens" (Rehan et al. 2008: 37). The uncontrolled burning of the healthcare waste release the hazardous gases which are injurious to human health

as well as affect the ecological resources and pollute the air. The positive aspect of the healthcare waste is the recovery of recyclable waste items which providing employment opportunities to the low income poor people of the society (Ahmed 1997).

3. Conceptual Framework

Developing a conceptual framework is important for the study because it helps the researcher to structure and justify his research. A conceptual framework "is something that is constructed, not found" (Maxwell 2012: 41). "It incorporates pieces that are borrowed from elsewhere, but the structure, the overall coherence, is something that you build, not something that exists ready-made" (ibid). This chapter presents the framework in this study. It will form the bases for the analyses, trying to explain, compare, and validate my findings.

Fig.1: Conceptual framework of factors determine hospital waste management (HWM).



Global environmental issues have been the focus of much countries and the public in general but one area that has been neglected and extremely controversial, especially in developing countries over the last two decades, has been healthcare waste management (HCWM) and its regulations and guidelines. The most common identified problem in developing countries are

the lack of proper healthcare waste management (HCWM) rules and regulations. Most of the developing countries have the basic rules and guidelines of healthcare waste management (HCWM) but unfortunately some developing countries even do not have the basic rules and regulation such as Bangladesh, Nepal, Maldives, and Sri Lanka. According to Ali & Kuroiwa "the most common problem identified by the managers (hospital administration) was a lack of clear and detailed guidelines for hospital waste sorting and disposal in the national policy document. Due to this, the policy is not uniform across hospitals" (Ali & Kuroiwa 2009: 253). Pakistan unlike other developing countries has basic guidelines for safe hospital waste management (HWM) but still need improvement in rules to become in line with the World Health Organization (WHO) standard. India also has basic legislation of healthcare waste management (HCWM) but need additional provisions to make it according to the World Health Organization WHO guidelines (Patil & Shekdar 2001). The malpractices of healthcare waste in Ghana is due to the "absence of a national policy, guidelines and standard operating procedures" (Asante et al. 2013: 110). The effective legislation of healthcare waste management (HCWM) results in better hospital waste management. The example can be seen in Kingdom of Bahrain where the healthcare waste management (HCWM) shown positive signs of improvement in recent years due to amendments and improvement in national healthcare waste management (HCWM) legislation (Mohamed et al. 2009).

A good, aware, and trained administration is important for the implementation of effective legislation of healthcare waste management (HCWM). According to Rasheed et al. "the proper management of health-care waste depends on good administration and organization along with adequate legislation" (Rasheed et al. 2005: 2). The study from Brazil shown that the Resolution No.283 in the Brazilian legislation related to the healthcare waste management (HCWM) is not only comply due to economic problems in the country that prevent the government from adequately supporting of the healthcare policy but also due to the lack of sensitivity and interest from management of the facilities and lack of awareness (Da Silva et al. 2005). The recently economically developed countries such as "Japan and Singapore have established compliance with the WHO requirements for which the reasons are obvious – financial and policy support, regulatory push, willingness of healthcare service providers" (Ananth et al. 2010: 156).

Many different reasons of the mismanagement and malpractices of healthcare waste is identified by the researchers, such as the economic condition of the country which explain by Patil & Shekdar that the "health-care waste management is not only a technical problem, but is also strongly influenced by economic conditions" (Patil & Shekdar 2001: 219). In Turkey

the Turkish Medical Waste Control Regulation (TMWCR) is not complied properly because of the limited budget allocation, lack of proper training and lack of reliable data (the amount of generated waste and its composition) (Alagöz & Kocasoy 2008). In addition, the shortage of skilled human resources, lack of educational materials for employees, (Ali & Kuroiwa 2009), "lack of awareness of the management regarding detailed laws and regulations governing health care waste management" (Arshad et al. 2011: 1418), and "lack of finances, equipment, proper hospital management teams and concern are the most potential problems in this life sensitive issue" (Hassan et al. 2012: 1786).

The proper healthcare waste management (HCWM) have involved different stages; generation, segregation, on-site transportation and collection, storage, on-site disposal, off-site transportation and collection, and final disposal. These stages are interdependent and one stage is directly proportional to other stage (improvement or dis-improvement effect the other stage directly). The "management of health-care waste depends on the input from the administration and active participation by trained staff in segregation, storage, collection, transportation, treatment and disposal" (Patil & Shekdar 2001: 217). The different studies show different reasons for the variation of waste generation in different countries and even within the country. The developed countries produce more healthcare waste because of use of disposable instruments and packaging materials rather than the use of reusable items (Asante et al. 2013). The generation of medical waste within country between hospitals are also different and depend upon the type of healthcare establishment, level of instrumentation, number of patients dealing per/day, location (Bdour et al. 2007) and "the size of healthcare facility, the segregation program of medical wastes, and the medical activities" (Jang et al. 2006: 108), such as the "increasing in quantity and variety, due to the wide acceptance of single-use disposable items (e.g. gloves, plastic syringes, medical packages, bedding, tubing, IV bad and containers)" (Jang et al. 2006: 114). The generation of medical waste also depend upon the number of beds, number and types of services offered, economic, social and cultural status of the patients, the level of instrumentation, general condition of the area where the hospital is situated (El-Salam 2010), the hospital's capacity, the number of medical staff, and the applied practices" (Tsakona et al. 2007). The availability of modern medical facilities and good services also produce more waste as study done in Tanzania shown that the "Aga Khan hospital (one of the best hospitals) were found to have a waste generation rate of 1.3 kg per patient per day, nine times that of Temeke hospital (0.15 kg per patient per day)" (Nemathaga et al. 2008: 1240). The proper segregation of healthcare waste can reduce the bulk of waste in hospitals.

The segregation of waste is the first and important stage in the healthcare waste management (HCWM) process. The reduction in infectious waste mainly depends upon the good segregation practices. The improper segregation or mixed collection of medical wastes increases the quantity of infectious waste (Patil & Shekdar 2001). The proper segregation practices make the whole process of healthcare waste management (HCWM) easy and risk free for human health and environment. The proper segregation of healthcare waste is major problem in hospitals of developing countries. In most developing countries healthcare waste is not segregated properly and mixed with the general waste and disposed with the domestic or general waste in the waste dumping sites which increased the human health threat and environmental pollution (Alagöz & Kocasoy 2008; Ali & Kuroiwa 2009; Bdour et al. 2007; Da Silva et al. 2005). The researchers explain different reasons of improper waste segregation such as; lack of knowledge and awareness both in hospital employees and public in general, lack of training of hospital employees from top to bottom, lack of proper check and balance system in hospitals, lack of interest by the hospital administration and employees. Sometime the hospital waste is mixed with domestic waste by the waste handling workers and dispose on the road side or open dumping site to get rid and sometime are mixed "to eliminate the expense of the treatment/disposal of the health-care wastes" (Alagöz & Kocasoy 2008: 1232).

The malpractices of on-site transportation and storage are common in developing countries. The waste in healthcare facilities collected manually by sanitary workers/sweepers without or limited using of protective gears and then transported to the on-site storage area (Alagöz & Kocasoy 2008; Ali & Kuroiwa 2009; Asante et al. 2013; Bdour et al. 2007; Da Silva et al. 2005; Manga et al. 2011; Patil & Shekdar 2001). The waste handling staff mixed the infectious and general healthcare waste during collection and transportation and store mix which increased the possibility of contamination of general waste (Mahwish. et al. 2013; Qadir et al. 2014; Teimori et al. 2014; Tsakona et al. 2007). The use of open trolley or push truck for on-site transportation and manual hand picking can lead to leakage or spillage of medical waste and exposing workers, patients and public to health risk and injury (Manga et al. 2011).

The infectious healthcare waste need proper treatment before final disposal. "The purpose of treatment is to reduce the potential hazard posed by health-care waste, while endeavouring to protect the environment" (Prüss et al. 2014: 104). There are many processes for infectious/hazardous medical waste treatment; autoclave, thermal, biological, chemical, microwave and incineration. The most using method is incineration, especially in developing countries and the reason is obvious that the "incineration as a waste management option

reduces the bulk waste volume and weight by about 90% (Manga et al. 2011: 114). Due to the inappropriate segregation of waste at the source a large amount of general waste and liquids (chemical, cytostatic/cytotoxic drugs) were also incinerated along with infectious waste, which results more emission to pollute air and environment (Tsakona et al. 2007). Incineration has some advantages such as; reduction in waste volume, the sterilization and detoxification of waste materials and recovery of heat or electricity and have some disadvantages including potential emission of toxic gases and substances to the air, high operation and maintenance costs, high initial investment, requirement of trained personal and proper disposal of produced solid ash residues (Jang et al. 2006; Teimori et al. 2014). The proper recycling and at source segregation practices can play a vital role in the reduction of medical waste, "for example, in China typical healthcare waste consists of about 10% food waste" (Ananth et al. 2010: 157). The replacement of old technologies with new one in hospitals can also help in reduction of waste. The "examples of such initiatives included recent replacement of traditional blood pressure devices and X-ray films with digitals" (Mohamed et al. 2009: 2406) in different hospitals of Kingdom of Bahrain and shown positive signs.

The final disposal of healthcare waste is the last stage of hospital waste management process. The proper and safe final disposal of the hospital waste is important to prevent and reduce the human health risk and environmental pollution. Most research studies from developing countries show malpractices of the final disposal of the healthcare waste either disposed to open dumping site without any prior treatment or inadequate landfilling (Akter 2000; Arshad et al. 2011; Asante et al. 2013; Bdour et al. 2007; El-Salam 2010; Hassan et al. 2008; Kumar et al. 2010; Patil & Shekdar 2001; Pescod & Saw 1998; Syed et al. 2012). The malpractices of the healthcare waste final disposal is mainly "due to poor guidelines and supervision" (Da Silva et al. 2005: 605). The infectious waste and incinerated ash and residues need proper and separate scientific landfill dumping according to the World Health Organization (WHO) recommendations. Because the improper final disposal pose serious threats to human health and environment such as; spread of Hepatitis B, Hepatitis C, HIV/AIDS, unpleasing smell, breeding ground for vectors (malaria parasite carrying mosquitos), easy access from insects, birds, stray animals and unauthorised persons (Manga et al. 2011), and "also wind easily blows over the dumped waste, dispersing air pollutants to nearby communities." (Nemathaga et al. 2008: 1243). The final disposal of the hospital waste and water without prior treatment also "cause pollution and contamination of water resources as well as affect aquatic flora and fauna" (Ahmed 1997: 97). According to Asante et al. if the healthcare waste, especially infectious

waste are not properly managed, the dangers pose will cost huge financial loss and death of human beings as well as animals (Asante et al. 2013).

4. Methodology

This chapter describes the approach and method through which this study was carried out. Methodology of the research study is important because it describe to the readers that how the data is collected and how it will address the research questions. This chapter presents research designing, sampling and method for data collecting. Moreover, it also covers the research context, ethics, and limitation of study.

4.1 Research design and approach

The initial phase of this study design started with the thinking about the research question and the data collection method. The preliminary work was done in the NMBU Norway, to analyse the validity of the research questions and its relevance to the city of Peshawar with in the paradigm of conceptual framework. A comprehensive research study proposal was developed with overall strategies and planning to collect the data and information in a logical way to answer the research questions efficiently. Unfortunately, less research is available on the healthcare waste management (HCWM) in Pakistan and specially in Khyber Pakhtunkhwa. Due to the less research availability, the descriptive research design and approach is adopted for this study. The descriptive research design provide researcher with the information about the phenomenon which has been little or less research. In research design the works "begin with an idea, gather theoretical information, design a research plan, identify a means for data collection, analyse the data, and report findings" (Berg 2001: 18).

Idea → Theory → Design → Data Collection → Analysis → Findings

Theory-before-research Model

The qualitative research design is "an interactive process that involve tacking back and forth between the different component of design, assessing the implication of purpose, theory, research question, method and validity" (Geertz 1976: 235). The research design also reflects decision about the priority being given to the different dimensions of the research method and process (Bryman 2008). It is the print of overall planning that researcher follows during research study. The research design involves thinking about the future study plane. It is necessary for the researcher to know what type of information and data is needed for the research project (paper/thesis) and how to collect, handle and finally analysed it? "The design for a research project is literally the plan for how the study will be conducted. It is a matter of

thinking about, imagining, and visualizing how the research study will be undertaken" (Berg & Lune 2012: 41).

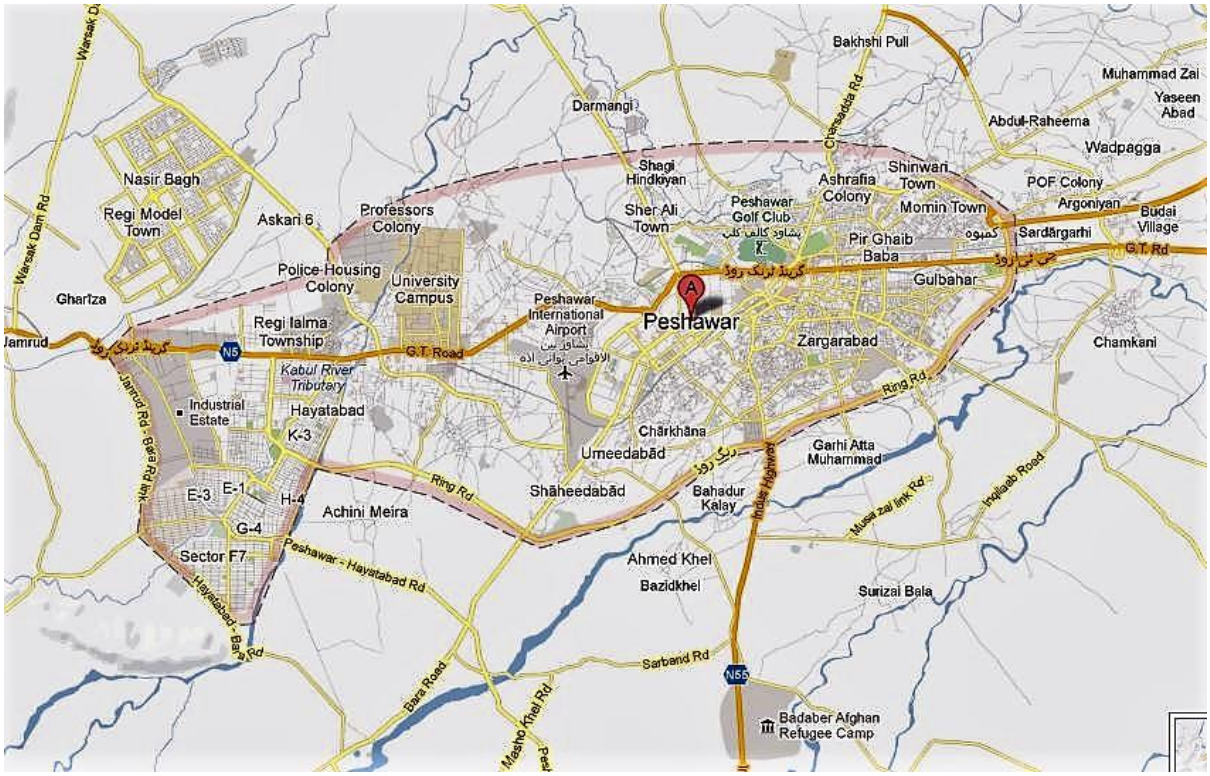
4.2 Qualitative research consideration of the study

The purpose of this research study is to put emphasis on the healthcare waste management (HCWM) practices in both the public and private hospitals of the city of Peshawar. This study demonstrates the current practices, implementation of hospital waste management (HWM) rules 2005, the overall reasons of the mismanagement and malpractices of healthcare waste management (HCWM) and the reasons of better waste management in private hospitals as compare to public hospitals. In the methodological term the objectives of this study is based on the perspective and interpretation of hospital staff, EPA staff and WSSP workers that can best be explained through qualitative research method.

Qualitative research refers to the meanings, concepts, definitions, characteristics, metaphors, symbols, and descriptions of things (Berg 2001) and defined as "an umbrella term covering an array of interpretative techniques which seek to describe, decode, translate and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world" (Al-Busaidi 2008: 11). In the health or social care setting, qualitative research is particularly useful where the research question involves the exploration of "implement-ability" (Hancock et al. 1998). The qualitative research is involved with the collection of non-numerical data including the description of the people feelings, behaviour, and experiences. The qualitative research approach was selected because of the nature of the study exploring the qualitative judgment and detailed understanding of the healthcare waste management (HCWM) in both the public and private healthcare sectors through the hospital staff, Environmental Protection Agency (EPA) employees, and workers directly deal with this waste, but it doesn't mean that the research approach does not include characteristics that belong to the quantitative method. The choice of the methodology adopted for this study is dependent on exploring the mismanagement, malpractices, and implementation status of the hospital waste management (HWM) in the public and private hospitals through the people working and dealing directly and indirectly with the healthcare waste in Peshawar.

4.3 Site selection

According to the theme of research study, I selected Peshawar, the capital city of Khyber Pakhtunkhwa province Pakistan for research study. Peshawar was chosen for research because of dense population, and several healthcare and environmental issues emerged due to the malpractices of the healthcare waste management (HCWM) during the last couple of decades. Peshawar considered among the oldest living cities in south Asia, situated at the entrance of the famous Khyber Pass. It has always been get way between South Asia and Central Asia, be it trade, people, investment or even invasions. The total area of Peshawar is 1257 km² and the total population according to 1998 censuses was 2019118 with the growth rate of 3.56% and estimated population in 2015 by the Bureau of statistic Khyber Pakhtunkhwa was 3702000 (Bureau Of Statistics 2015b: 3).



Source: Google Map *Map of Peshawar*

According to the Bureau of Statistic Khyber Pakhtunkhwa data 2014, in both public and private sectors the total numbers of hospitals were 190, with 17602 available beds.

Table. 4.1 Detail of the available government and private hospitals.

Province/District	Total		Government		Private	
	Nos.	Beds	Nos.	Beds	Nos.	Beds
Khyber Pakhtunkhwa	190	17602	157	16619	33	983
Peshawar	48	5971	18	5243	30	728

Source: Bureau of Statistic Khyber Pakhtunkhwa-2015 (Bureau Of Statistics 2015a: 157)

I had chosen four major hospitals from both the public and private sectors. The two major hospitals had selected from each sector. From the public/government sector, the Govt Hospital (A) and the Govt Hospital (B) had selected. Both are teaching hospitals and deal with thousands of patients daily. They also provide training to nursing and paramedic students. From the private sector, the Pvt Hospital (A) and the Pvt hospital (B) had selected. Both are the teaching hospitals (have its own medical colleges) and have the general and specialized facilities. For the characteristics and description, details of both the public and the private healthcare facilities see (Tab 4.2).

Table. 4.2 Characteristics of the surveyed healthcare facilities/ hospitals.

Hospital Designation	No. Departments	No. Wards	No. Beds	Description
Govt/Public (A)	9	20	1280	Located in densely populated area and treats both general and specialized cases. It is a teaching hospital and has a nurses training centre.
Govt/Public (B)	23	28	1202	Located in high densely populated area. Treats both general and specialized cases. It is a main teaching hospital because of its vast available departments and high capacity for patient's treatment and has a nurses training school/centre.
Private (A)	34	--	500	A privately-owned facility located in modern and medium densely populated area. Treats both general and specialized cases. Teaching hospital and has a nurses training school/centre.
Private (B)	33	--	220	A privately-owned facility located in modern and medium densely populated area. Teaching hospital and treats both general and specialized cases.

4.4 Sampling

Due to the nature of the research study and for the pragmatic reason, purposive sampling had used. The key respondents were interviewed using purposive samples. In qualitative research method, purposive sample strategy is used for the selection of individuals based on specific knowledge. In purposive sample a settings, persons, or activities are selected intentionally to provide information's that are relevant to the researcher goals and objectives. Some researchers use their special knowledge or expertise about some identified group to select subjects who represents this population (Berg & Lune 2012). The selection of such individual can give the accurate information which the researcher need to answer his research questions. The purposive sample was adopted for this research study whereas the individuals were selected based on knowledge about the essential aspects of the healthcare waste management (HCWM) and the current practices in the public and the private hospitals.

4.5 Data collection

The data collection for this research study principally based on qualitative method but it does not mean that the data does not include characteristics that belong to quantitative method. Mainly three kind of methods were used to collect the data for this study; semi structured interviews, informal interviews and secondary literature and sources. The semi structured/standardized and informal interviews were conducted during the field visit. From the already available literature, I tried to establish the validity of this study, what is already known about the healthcare waste, its management, and practices. According to Maxwell 2012, in qualitative research study data collection method include everything that researcher see, hear and communicated during the field visit and the course of data collection and flexible enough to give wider space to respondents to share more information (Maxwell 2012). During field visit, I interviewed thirty-seven (37) respondents through semi-structured interview and seven different people through informal interview. The respondents were interviewed based on the working and dealing directly or indirectly with the healthcare waste and have knowledge about the essential aspects of the hospital waste management. I have also personally visited and observed all the hospitals to collect the visual data. For detail of interviewee, see (Tab 4.3).

Table. 4.3 Number of interviewers during field visit/surveyed healthcare facilities.

Hospitals	Administration	H. Cord.	B.M Engineer	C. S Inspector	Head Nurse	Sweeper	Incinerator Operator	EPA Director	EPA Inspector	WSSP Worker	Total
Govt (A)	1	0	1	1	2	2	1	1	2	4	15
Govt (B)	1	0	1	1	2	2	1	0	0	0	8
Pvt (A)	1	1	0	0	2	2	1	0	0	0	7
Pvt (B)	1	1	0	0	2	2	1	0	0	0	7
Total	4	2	2	2	8	8	4	1	2	4	**37**

Note: *Administration, H. Cord. (Housekeeping Coordinator), B.M Engineer (Bio-medical Engineer), C.S Inspector (Chief Sanitary Inspector), Head nurse, Sweeper Incinerator Operator, EPA Director, EPA Inspector, WSSP Worker (Water and Sanitation Services Peshawar Workers).*

4.5.1 Semi structured interviews

For this research study, semi-standardized or semi-structured interview method was adopted. This approach was helpful to me because of flexible enough to move back and forth and re-order the pattern of the questions during the interview with interveners. The unstructured interviews are loosely structured with no specific prepared and set sequence of questions. The interviewer can change and adjust the questions even in the meantime of the interview (Berg & Lune 2012). The semi structured/standardized interview is "located somewhere between the extremes of completely standardized and completely unstandardized interviewing structures" (Berg 2001: 70). During these interviews, I asked several pre-determined questions from each interviewee but correspondents were allowed freedom to answer and I was changing the pattern of questions according to the discussion. According to Bryman in semi-standardized or semi-structured interview "question may not follow the exact pattern as it outlined" (Bryman 2008: 438).

4.5.2 Informal interviews

This method of interviews is belonging to informal discussion about the research topic to ordinary mass during the chores of daily or routine life, to get more information. During my stay in Peshawar informal interviews were conducted with seven people belong from different

categories of the health staff (Doctors, junior and student nurses and paramedics) and other related actors (private sanitary workers, private waste contractors and transporters, etc.). These kinds of interviews help me to receive more information about the historical background of the issue, the current healthcare waste management (HCWM) practices, and the reasons of malpractices on the ground level in the city of Peshawar. Such kind of information also helped to know the general perception of the local people about the issue and identify some useful dimensions.

4.5.3 Secondary literature and sources

Secondary data has also been important in this research study for gaining the historical background of the issue and understanding more in-depth how the previous researchers conduct the researches to address this human sensitive issue. In Peshawar, the department of environmental sciences library and the university of Peshawar main library were key resources. I also visited the Government Health Department, and Government Environmental Department of Khyber Pakhtunkhwa. Similarly, I visited the Khyber Medical College (KMC) library in Peshawar. The relevant literature was found in various forms but in fewer amounts. Beside all these, I also searched online sources such as the website of the Environment Ministry, the Health Ministry, World Health Organization (WHO) and different environment related journals. These websites provided relevant literature about healthcare waste management and current practices.

4.6 Data management

Data management involves all stages of research such as collection, handling, documentation, and storage. Berg and Lune explain that "a clear working storage and retrieval system is critical if one expects to keep track of the reams of data that have been collected, to flexibly access and use the data, and to assure systematic analysis and documentation of the data" (Berg & Lune 2012: 55). The data management is required to bring the data into readable and understandable form. During data management, my focus was on the research objectives and questions that whether it addresses the specific issue for which the data is collected. After each interview, I write in personal computer to make the data clear and safe. A separate folder was made for each category of interviewers, which was later discussed in analysis part in details.

4.7 Validity and reliability

In the qualitative research study Validity and reliability set some important criteria to measure the quality of the research. In research the validity and reliability examines the conceptual adequacy of the research and validate how the researcher research is "theoretically and empirically related to other studies in the same field" (Crang & Cook 2007: 146). Validity is "referring to credibility of a description, explanation, interpretation and conclusion of the research" (Maxwell 2012: 122). The validity of this research project can be measured based on the object investigated to answer the research questions or address the objectives of the study. To ensure the credibility of research, I collected data through semi-structured interviews by using purposive sample. Purposive sampling helped me in interviewing the relevant respondents to this research project. I also compared the collected data with other available scholarly articles and work, research papers and the government of Pakistan hospital waste management (HWM) rules 2005 notification.

4.8 The research timing

During research design, my field work was scheduled for one and half of month. The research timing was planned based on familiarity with the area and people. However, during field visit several challenges emerged that redefined my research plan and I spent half month extra in the field to collect data. The data collection in the hospitals is challenging and difficult to reach the accurate and relevant information. During data collection researcher is dependent on the favour and cooperation of interviewer for contributing in the research study. I had face many challenges but my communication skills play vital role in minimizing these challenges. According to Maxwell the personal background of researcher has considerable influence on the research study (Maxwell 2012). That's why having a shared linguistic, ethnic, and cultural background enabled me to collect a considerable information for this research thesis.

4.9 Ethical consideration

Berg and Lune explain the ethics in qualitative research as the concept of "Do Not Harm" referring to avoid any emotional and physical harm (Berg & Lune 2012). The clear aspects of ethics in methods part of research are informed consent, privacy, anonymity, and confidentiality. In both the public and the private hospitals majority of the respondents are

usually reluctant to share information about the sensitive and essential issues related to the healthcare waste management. The actual name of the hospital and respondent will not be mentioned but only the designation of the respondent will be mention in the writing phase. Moreover, as promised no such information should be leaked that harm the respondent. During writing phase allot of consideration was given to the quotations of the respondents to ensure their anonymity.

4.10 Limitation of study

Access to the relevant data in the hospitals is always challenging since the government and private hospitals are reluctant to share their healthcare waste management (HWM) record openly because it may affect their credibility. The permission from the hospital heads to conduct interviews with the employees and take pictures within the hospitals was a major challenge. First, I personally met all the hospital heads and introduced my research project and myself. Everyone directed me to process the application for permission through proper channel, which I followed and it took long time to get permission. The one unexpected thing, which I had faced; was that one private hospital did not allow me to take any picture of hospital premises. Majority of the interviewers were reluctant to share all information related to all the aspects of the healthcare waste management (HCWM) due to lack of trust. Hence, they tried to avoid certain questions or gave neutral answers.

The research may reflect certain biases towards the hospital administration and employees and different governmental institutions such as legislative authorities, Environmental Protection Agency (EPA) and Water and Sanitation Services Peshawar (WSSP), of Khyber Pakhtunkhwa, regarding their policies and interest toward healthcare waste management (HCWM). I have taken slightly rigid stance toward the government policies, waste management legislation and lack of interest of hospital administration and staff in solving this life sensitive issue, in analytical portion of this study not because of my personal predilection but it reflects the opinion of the interviewers based on their experiences in their respective fields. This research project highlighted the perspective of the different people related directly or indirectly to the healthcare waste management (HCWM).

5. Analysis and Discussion

This chapter presents the analysis and discussion of the research study conducted on the hospital wastes management and reasons of malpractices in both the public and the private hospitals in the provincial capital city of Peshawar, Khyber Pakhtunkhwa, Pakistan.

5.1 Types of healthcare waste

The composition and types of the healthcare waste in both the Govt hospitals were found almost the same due to the same structure of wards and departments. The analysis of the data also shows that both the Pvt hospitals almost produce the same types of healthcare waste as in Govt hospitals. The types and details of produced healthcare waste in both Govt and Pvt hospitals are described below in Table.5.1.

Table 5.1 Waste categories produced in both Govt and Pvt surveyed healthcare facilities

Waste category	Description
General waste	This category included food waste (also from canteens), office paper, cardboard, cans, non-contaminated glass and metal, x-rays sheets, plastic bags, packaging.
Sharps	This category included needles, syringes, intravenous needles and tubing's, scissors, blades, broken vials, and glassware.
Infectious waste	This category included wastes from wards and materials or equipment contaminated with blood and its derivatives from OTs, other body fluids or excreta and body parts. Blood bags and blood soaked bandages, dressings, surgical gloves, laboratory culture, swabs, stocks, sputum cultures from laboratories, contaminated blood clots and glassware material generated in the medical analysis laboratories.
Pharmaceutical/ Chemical waste	This category included expired medicines from pharmacy and wards, broken thermometers, and toxic chemicals from laboratories.

The proper record of the healthcare waste was not present in both the Govt and Pvt hospitals. Only the Govt (B) hospital has a register for writing the weight of generated waste but the hospital supervisor writes approximate weight without weighting. The various types of the waste were studied at every hospital on the bases of information provided by the head of the waste management team/department, sanitary workers (experienced), incinerator operators, and personal observation.

5.2 Quantity of healthcare waste

The actual calculation of generated healthcare waste is almost impossible in both the Govt and Pvt hospitals due to the lack of actual and proper measurement and analysis system. For approximate weight calculation of the healthcare waste in both the Govt and Pvt hospitals the formula has been taken from Ahmed (1997). The below formula is used for approximate weight calculation of the healthcare waste generation in each Govt and Pvt hospital.

Total generated healthcare waste = waste generated by patient/day x Total number of beds available x Numbers of hospitals

For example, in Govt (A) hospital:

Total generated healthcare waste = 2 kg/day x 1280 beds x 1

2560 kg/day

According to the above formula, the Govt (A) and Govt (B) hospitals produced a total waste of 2560 kg/day and 2163.6 kg/day, respectively. The approximate waste generation in the Pvt (A) and Pvt (B) hospitals, is 1000 kg/day and 550 kg/day, respectively. The information collected during interviews in both the Govt hospitals has shown that the total and infectious healthcare waste produced is,1.5 – 2 kg/bed/day and 0.3 kg/bed/day (approx.) and 1.8 kg/bed/day and 0.4 kg/bed/day (approx.), for Govt (A) hospital and Govt (B) hospital, respectively. In the Pvt (A) hospital the total and infectious waste generation rate was 2 kg/bed/day and 0.5 kg/bed/day (approx.) and in Pvt (B) hospital 2.5 kg/bed/day and 0.5 kg/bed/day (approx.), respectively.

The overall healthcare waste production in both Govt hospitals is higher than Pvt hospitals. The main reason for the higher waste generation in Govt hospitals in comparison to the Pvt hospitals is the presence of more number of beds in Govt hospitals. However, proper and actual healthcare waste measurement and management system is not available in any Govt and Pvt hospital. Consequently, the future planning for better Health Care Waste Management (HCWM) may not be possible. As, proper and better future waste management's planning depends upon the availability of the accurate information, it is important that the healthcare waste composition and generation system has access to reliable information.

5.3 Current waste management practices

5.3.1 Segregation and on-site collection

The segregation of hospital wastes at the point of generation is the first and important stage. In both the Govt hospitals, waste segregation at the point of generation was absent. While both the Pvt hospitals were practicing the segregation of waste at the point of generation. The on-site collection of waste practices was found to be poor in both the Govt and Pvt hospitals. The details are mentioned in the table 5.2.

Table. 5.2 Waste segregation and on-site collection practices in all hospitals.

Hospitals	Waste Segregation	On-site Collection
Govt (A)	No Segregation	Poor
Govt (B)	No Segregation	Poor
Pvt (A)	Partial Segregation	Poor
Pvt (B)	Full Segregation	Poor

Except the Pvt (B) hospital all other hospitals have no or improper waste segregation at the point of generation. Both the Govt hospitals are using only one kind of waste bin and one colour of plastic bags in all wards and departments included emergency services. All the generated healthcare waste is disposed in one waste bin. The sweepers in both Govt hospitals were responsible for waste collection from all wards. They collect the waste one time on daily basis, without using protective gears. The same workers transported the waste to the main storage area and incinerator. The surveyed Pvt hospitals were found to be segregating the waste according to the colour coding concept. The housekeepers use partial safety gears during waste collection.

Table. 5.3 Colours of plastic bags used by the hospitals and their description.

Hospitals	Colour used	Description
Govt (A) & Govt (B)	Black and Blue, respectively	Used for disposing mixed waste in one plastic bag.
Pvt (A)	Yellow, Green, Red	Yellow colour bags were used in wards and casualty (emergency department), green colour bags in offices and kitchens, and red colour bags in OTs, CCU and laboratory.
Pvt (B)	White, Yellow, Blue, Red	White colour for general and food waste in wards, yellow for infectious waste in wards, blue for main canteen/cafeteria waste, and red for OTs infectious waste.

The use of colour coding concept for waste segregation in both Govt hospitals was absent. The administration of the hospital had provided only one kind of waste bin and one colour of plastic bags to all wards and departments. The colour coding technique for segregation of waste in majority of the government hospitals was not common standard practice and "did not have the concept of colour coding process at all" (Hassan et al. 2012: 1791). Inside wards, every patient has its own small plastic waste bin below their bed and dispose every kind of generated waste in the same bin, including the waste from the paramedic's staff and nurses (sharp and infectious material), patients and visitors (general and food waste). The study conducted by Mahwish et al. found that the same results, stating "the common practice, especially in government hospitals, are that plastic boxes were used for the disposal of the sharps and other highly infectious waste and they were not being separated from other kind of waste at source" (Mahwish. et al. 2013: 13). The sweepers collect all the healthcare waste in one big plastic bag fixed in one big waste bin and deliver to the open storage area and incinerator. The waste handling staff do not used proper Personal Protection Equipment (PPE) during waste collection. They are unaware about the high health risk of the infectious healthcare waste. these results are also supported by Kumar et al. study, which describes that the "staff in the hospitals was handling the waste without using the impervious gloves and face masks and was not aware of the potential hazards as per the WHO guidelines" (Kumar et al. 2010: 104). In both the Govt hospitals waste was collected one time daily from all the wards and departments.

In contrast, the Pvt (B) hospital used different colours of plastic bags for different categories of waste. While the Pvt (A) hospital used colour bags to segregate the waste based on wards

and departments instead of categories (see Tab.5.3). The waste handling staff used partially protective gears during waste collection. The situation in both Pvt hospitals was better than Govt hospitals but the word 'better' doesn't mean that they fully follow or comply with hospital waste management (HWM) rules 2005. The study done by Kumar et al. shows the same results that "segregation was not properly followed, in almost all of the 9 allied public and private hospitals, as per WHO guidelines on HCWM, and Pakistan Biosafety Rules 2005" (Kumar et al. 2010: 104). One other study has the same findings that "the waste is being segregated but the colour coding for waste bags are not followed as suggested by Hospital Waste Management Rules 2005" (Ali et al. 2015: 126). The Pvt (A) hospital collect waste three times in twenty-four hours, 7:00 o'clock in morning, 14:00 o'clock in afternoon and 22:00 at night and the Pvt (B) hospital collect waste two times daily from all wards and departments.

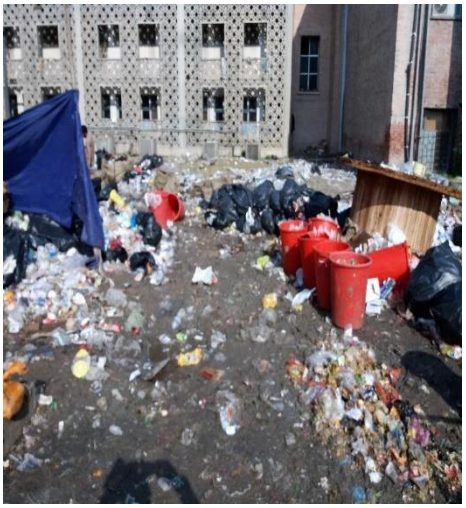
5.3.2 Storage, on-site transportation, and disposal

The poor and improper storage and on-site transportation was observed in both Govt hospitals. The Pvt hospitals have better storage and on-site transportation practices. The incineration method was used for disposal of infectious medical waste by both the Govt and Pvt hospitals and every hospital installed its own incinerator. For detailed description, see table 5.4.

Table. 5.4 The results of storage, on-site transportation, and disposal practices.

Hospitals	Storage practices	On-site transportation practices	Disposal practices
Govt (A)	Poor	Poor	Good
Govt (B)	Poor	Poor	Good
Pvt (A)	Better	Better	Good
Pvt (B)	Better	Better	Good

The public hospitals have no proper storage area and on-site transportation practices. The generated waste is kept mixed in open storage area and some unorganized is placed beside the incinerator. Unauthorized persons, stray animals and birds have an easy access to this open stored waste (Picture No.1 & 2).



Picture No.1

Picture No.2

Mahwish et al. study has the same finding and explains that "the storage facilities at hospitals and healthcare establishments were found to be made of unsuitable materials and were not regularly cleaned, cleared, or disinfected" (Mahwish. et al. 2013: 14). All kinds of waste (infectious and non-infectious) were loaded at the same time in an open and sharp edged trolley for delivery to the storage area and incinerator (Picture No. 3).

Picture No. 3

The research study of Kumar et al. also show the same results and says that "the waste was being collected in open trolleys once a day in the morning without using the proper standard operating procedures of waste transport" (Kumar et al. 2010: 104).

Incineration of waste is used in all the surveyed Govt and Pvt hospitals as waste disposal and management option to reduce the bulk waste volume and its characteristic toxicity. According to Alvim and Afonso the incineration of waste reduces the bulk waste volume and weight about 90% (Alvim-Ferraz & Afonso 2003). Incineration of infectious waste does not mean that it has become 100% non-hazardous., It needs proper landfill dumping of the incinerated ash. All the installed incinerators were local made and during survey, it was observed that they were not

capable of fully incinerating the hospital waste. The incinerated hazardous and infectious materials' ash can be seen in Picture No. 4 & 5).

Picture No. 4

Picture No. 5

In private hospitals, the storage practices were better but on-site transportation was poor. The surveyed Pvt hospitals have proper storage areas beside incinerators, which was protected from access of unauthorised persons, stray animals, and birds (Picture No.6). The on-site transportation was better but not according to hospital waste management (HWM) rules 2005. All the surveyed Govt and Pvt hospitals used incineration as the standard and proper disposal method for the infectious waste.

Picture No. 6

5.3.3 Off-site collection, transportation, and final disposal

The off-site collection, transportation and final disposal practices were found to be poor and below the hospital waste management (HWM) rules 2005 standards and guidelines. A central waste collection company named Water and Sanitation Services Peshawar (WSSP) is responsible for the off-site collection, transportation, and final disposal. The Water and Sanitation Services Peshawar (WSSP) is a government owned company and was founded in 2014.

Table. 5.5 The off-site collection, transportation, and final disposal practices in all surveyed hospitals.

Hospitals	Off-site collection	Off-site transportation	Final disposal	Responsible
Govt (A)	Poor	Poor	Poor	WSSP
Govt (B)	Poor	Poor	Poor	WSSP
Pvt (A)	Poor	Poor	Poor	WSSP
Pvt (B)	Poor	Poor	Poor	WSSP

The Water and Sanitation Services Peshawar (WSSP) collects the general waste and incinerated ash once or twice a week from all the hospitals. This company uses open and sharp edges vehicles for off-site collection, transportation, and final disposal of waste (Picture No.7). The WSSP also hire private waste collection sub-contractors due to lack of employees. The WSSP and the private sub-contractor workers do not wear proper protective gears and are unaware about the potential health risks of direct contact with the hospital waste (Pic No. 7).

Picture No.7

In an interview, the WSSP and the sub-contracted workers told that they dispose all kind of waste (general waste and incinerated ash) to the ring road open waste dumping site situated on the ring road of Peshawar. There are no separate disposal facilities for the disposal of incinerated ash. Hence, all the waste is disposed in an open dump area. The ring road open waste dumping site is not restricted and secured and is easily reachable for human beings, stray animals, and birds which pose a serious threat to human health and environment. “The disposal of health care wastes in open dumps or landfills without adequate design considerations that guarantee the protection of the environment may pose serious health and environmental hazard” (Manga et al. 2011: 113). It has been reported in various research studies that the disposal of the hospital waste in open and uncontrolled dumps site is the most common practice and method of waste disposal in many developing countries. This kind of poor and improper

disposal practice poses the most dangerous risk to the public health as well as to environment (Diaz et al. 2005). The major problems associated with open and uncontrolled dump sites whether onsite or offsite include open access to unauthorised persons, stray animals, birds, and environmental pollution, poor protection practices of municipal waste workers/handlers and recovery of informal materials (Manga et al. 2011).

5.3.4 Open burning and recycling

The open burning of the healthcare waste and recycling of the recyclable items in the healthcare waste was not observed in both the Govt and Pvt hospitals, except Pvt (B) hospital which is practicing partial recycling. The open burning of waste was also observed on the final disposal site. The final disposal site was not restricted and easily accessible to unauthorised persons, stray animals, and birds.

Table. 5.6 Open burning and recycling practices in both the Govt and Pvt hospitals.

Hospitals	Open burning	Recycling
Govt (A)	No	No
Govt (B)	No	No
Pvt (A)	No	No
Pvt (B)	No	Partial recycling

Although open burning of the healthcare waste in all the hospitals premises is not practiced, however, it was observed at the final dumping site (ring road open waste dumping site). All kind of the mixed waste was burned, releasing smoke and other particulate emissions in environment. To get rid of hospital waste, it is burnt openly or buried lacking compliance with rules and regulations, which raises various environmental and human health concerns (Haque 2006). The same findings of the study conducted by Mahwish et al. explain that "sometimes such open dumping places are put on fire which creates further waste and pollutes the local environment" (Mahwish. et al. 2013: 14). The "open burning of medical waste releases pollutants which are usually emitted either in condensed (particulate matter) or in gaseous phases" (Manga et al. 2011: 114), and the most common emitted pollutants are: sulphur dioxide, carbon monoxide, hydrogen chloride and nitrogen oxide (WHO. 2000).

The recycling of the waste materials (cardboard, papers, packaging, plastic bottles, tin cans, etc.) were not practiced in all the surveyed hospitals, except the Pvt (B) hospital, which stored recyclable waste (cardboards, packages, papers and plastic bottles) separately and then sent it to the recycling factories (see Picture No.8 & No.9).

Picture No.8

Picture No.9

It was also observed that some workers of the private waste contractor in the open stored area of Govt (A) hospital were busy in separating infectious items (urine bags, blood bags, disposable drips along sets, undestroyed syringes, infusion tubes, etc.) from the rest of the healthcare waste. It was obvious that they do not realize the health risks (HBV, HCV, and HIV/AIDS and other diseases) of direct contact with these infectious wastes.

5.4 Implementation status of the hospital waste management (HWM) rules 2005

The federal ministry of environment introduced and implemented the hospital waste management (HWM) rules in 2005 through notification. In notification, it was said that the rules shall come into force at once. The notification has total twenty-six (26) main sections. According to the section No.3 of the notification, (Responsibility for waste management), every hospital is responsible for the proper and safe healthcare waste management from the point of generation to the final disposal. The poor practices of the hospital waste management (HWM) rules 2005 were found in all the Govt and Pvt surveyed hospitals.

The formation of waste management team is mentioned as compulsory in the notification of hospital waste management (HWM) rules 2005 for every hospital. The section No.4, 5 and 6 of the notification deals with the structure of the waste management team, the duties and responsibilities of waste management team, and the meetings of waste management team, respectively. In both Govt and Pvt hospitals, no such waste management teams were found. The implementation of the section No.4 in Pvt hospitals is not practically possible because of the different administrative structure. The structure of the waste management team in the section No.4 is designed for the Govt hospitals because the government employment

designation structure is used in the section No.4. Both the Pvt hospitals in this study have separate departments with different and simple structure, which is discussed in detail in the following section. The section No.7 to section No.14 of the hospital waste management (HWM) rules deal with the duties and responsibilities of different hospitals employees regarding the waste management. Some of the mentioned employees and their designation mentioned in section No. 7 to 14 are not present in the Pvt hospitals. For example, in the section No.9, 13 and 14, the Infection Control Officer, the Hospital Engineer, and the Waste Management Officer, respectively are not existing. In both the surveyed Govt hospitals, no documents of evidence were provided with the duties and responsibilities of different employees mention in the hospital waste management (HWM) rules from section NO.7 to section No.14.

The section No.15 of the hospital waste management (HWM) rules explains the Waste Management Plan for the proper and safe healthcare waste management. Every hospital must have a waste management plan prepared by the waste management officer and approved by the waste management team. The section No.15 is dependent upon the section No.4 and No.7. In section No.7, the appointment of the Waste Management Officer is the responsibility of Medical Superintendent (MS) but now the government has changed the designation of Medical Superintendent (MS) to Medical Director (MD). So, the section No.7 need revision. For the implementation of the section No.15 of the hospital waste management (HWM) rules, first the section No.4 and No.7 will require implementation. None of the surveyed Govt hospital practices the proper Waste Management Plan. The implementation of section No.15 of the hospital waste management (HWM) rules is not practically possible in the Pvt hospitals but unfortunately, none of the Pvt hospital provide the Waste Management Plan for proper and safe healthcare waste management.

The better waste segregation process reduces the volume of infectious waste and the human health risk. Unfortunately, in the Govt hospitals no proper waste segregation system was in place. The Pvt hospitals have a proper waste segregation system. The Pvt (A) hospital do not complies with all the paras of section No.16 (waste segregation) and the Pvt (B) hospital complies with almost all the paras of the section No.16 of the hospital waste management (HWM) rules 2005. The section No.17 related to the waste collection was poorly practiced by both the Govt and the Pvt hospitals. there is lack or improper use of protective gears by the handling staff, lack of labelling of the waste bags before removal to indicate the production

point and ward, and lack of cleaning the containers/bins after removal of waste bags and before replacement of the new one.

The section No. 18 (Waste transportation) of the hospital waste management (HWM) rule 2005 have five (5) Paras and eight (8) sub-paras but not even a single para or sub-para were found to be in practice by both the Govt and the Pvt hospitals. The para No. 5 of section No. 18 explains the off-site transportation method. The Water and Sanitation Services of Peshawar (WSSP) are responsible for the off-site transportation of the healthcare waste to the final disposal site. The WSSP does not follow even a single sub-para of para No. 5 of the hospital waste management (HWM) rules 2005. The proper central storage facility is important for the safe storage of healthcare waste to protect it from the access of unauthorised persons, stray animals, and birds to minimize the health risk and environmental pollution. For this purpose, section No. 19 (Waste storage) is included in hospital waste management (HWM) rules 2005. This section has seven (7) paras but unfortunately, no para was being implemented by both the Govt hospitals. The Pvt (A) hospital has practiced only two paras, i.e. para No.2 and No.7 (proper central storage facility and thorough cleaning) while the Pvt (B) hospital has practiced para No. 2, 5, 6, and 7.

The final disposal of the healthcare waste is an important and last stage of the hospital waste management process. The Ministry of Environment included section No. 20 in the hospital waste management (HWM) rules 2005 for the proper and safe final disposal of the hospital waste. The section No. 20 (Waste disposal) has eleven (11) paras and all the Govt and the Pvt hospitals poorly practice this section of hospital waste management (HWM) rules. The Govt hospitals kept the incinerated ash and residues in open area and exposed to air, rain, and other weather effects, which poses high risk to human health and environmental pollution. The Pvt hospitals did not show their storage system of incinerated ash and residues. The final disposal of waste to the dumping site by WSSP was poor and the waste handling workers were not using the proper protective gears. The Ministry of Environment mentions that the separate burial of incinerated ash and residues and other risk waste in separate area of landfill but the government do not provide the separate landfill for this kind of risk waste. So, the WSSP dispose mix all kind of waste in one open dumping site.

Open burning of any kind of waste release different gases into the air and pollute both the air and the environment. The open burning of the healthcare waste is more dangerous because of having infectious waste and have more chances of emission the hazardous gases, which can pose serious threats to both the health and environment. The hospital waste management

(HWM) rules 2005 are silent about the open burning of waste. The recycling of non-infectious waste can minimize the balk volume of healthcare waste but the hospital waste management (HWM) rules 2005 has no proper guidelines for recycling of waste. In the section, No. 22 (Waste minimization and reuse) some advises are included for waste reduction and the return of unused or waste chemicals such as mercury, cadmium, nickel and lead-acid, gas cylinders and return of high level radioactive waste to the original supplier.

The hospital waste management (HWM) rules 2005 need revision and amendments to make them practically applicable in both the Govt and the Pvt hospitals. The present hospital waste management (HWM) rules are specifically prepared for the Govt hospitals and most of the sections and paras explaining the rules and regulation are not practically implementable in the Pvt hospitals. For a better and safe healthcare waste management and protection of human health and environment, government needs to revise the hospital waste management (HWM) rules 2005 to make it simple and practicable in both Govt and Pvt hospitals.

5.5 The main reasons of the overall mismanagement and malpractices

The main reasons of the overall mismanagement and malpractices of the hospital waste management are based on the respondents' responses and perceptions. Lack of government interest, lack and complication of rules in hospital waste management (HWM) rules 2005, lack of proper check and balance system, lack of proper healthcare waste management (HCWM) subject in medical colleges, nursing and paramedic school's curriculum, and knowledge, awareness and training are the main reasons behind the overall mismanagement and malpractices of the healthcare waste management.

5.5.1 Lack of government interest in HCWM

Law is necessary and important to run any government and non-government organization or department. If the law is good enough or perfect, the organization or the department will work well and meet with the needs of the people. The healthcare waste management rules were formulated by the federal ministry of environment in Pakistan with the name of Hospital Waste Management (HWM) Rules 2005. In year 2010, the federal government made the eighteenth (18th) amendment in constitution and the health subject was transferred from centre to the provinces. Now the health subject is under the authority of provinces. Therefore, the provinces are free to make new rules for healthcare waste management (HCWM) or amend the hospital

waste management (HWM) rules 2005. The government of the Khyber Pakhtunkhwa is still following the same rules with the same name hospital waste management (HWM) rules 2005. This shown the lack of interest of the government of Khyber Pakhtunkhwa. In his interview, the Director of Environmental Protection Agency (EPA), told that they have a plan to make changes and amendments in the hospital waste management (HWM) rules 2005. When I asked which kind of changes they have planned or under consideration, he replied that still he is not sure but the changes will be minor not major. In the last seven years, the EPA did not try to revise or amend the hospital waste management (HWM) rules 2005.

5.5.2 Lack and complication of rules in hospital waste management (HWM) rules 2005

The hospital waste management (HWM) rules 2005 need revision and few amendments due to lack of rules. The hospital waste management (HWM) rules are completely silent about the open burning of hospital waste and punishment in case the rules are violated. The recycling of non-infectious waste materials minimizes the bulk volume of hospital waste. Some rules regarding recycling of waste are included in section No.22 but more rules are needed to force the hospitals to segregate the recyclable waste from the healthcare waste and do not incinerate with the infectious waste to protect the environment. The hospital waste management (HWM) rules are especially made for Govt hospitals and many sections are not practically possible to implement in Pvt hospitals such as section No.4 to section No.14. These sections including the section No.23 (Inspection) and the section No.24 (Hospital Waste Management Advisory Committee) need amendment to make them practically implementable in both Govt and Pvt hospitals.

5.5.3 Lack of proper and simple check and balance system

The lack of proper and simple check and balance system in the hospitals is another contributing issue to the mismanagement and malpractices of the healthcare waste management. The government of Khyber Pakhtunkhwa has no proper and simple check and balance system for hospital waste management. Within the hospitals, the hospital administration is responsible for the check and balance of the healthcare waste management (HCWM) and externally the Environmental Protection Agency (EPA) is responsible for the check and balance of the installed incinerators in the hospitals and the final waste dumping site. In interview the EPA director and the inspectors told that, they do not have enough resources to supervise all the installed incinerators in Govt and Pvt hospitals and waste dumping sites properly. Due to the

lack of resources, they are unable to implement their rules and regulations regarding the incineration emission, off-site transportation, management of incinerated ash and residues disposal and infectious waste landfill dumping. They also mentioned that the accountability procedure of the hospitals is very complicated. The EPA inspectors explained the accountability procedure of the hospitals; first the EPA inspector visit the hospital to check the installed incinerator, off-site transportation, and final disposal method. If any practice is not according to the EPA and the HWM rules and it poses human health threat and environmental pollution then the Inspector reports the malpractices of the concern hospital to the department. The EPA issues the hearing notice to the guilty hospital. After the hearing notice the inspector again visits to check if the problem is fixed? If not, Environmental Protection Order (EPO) is issued by the EPA Director General (DG). After the order, inspector again visits the same hospital for inspection. If the order is still not followed or fulfilled by the hospital, the EPA sends the case to the Environmental Protection Tribunal (EPT) to follow up the case and make a final decision. If the Environmental Protection Tribunal (EPT) is not available then the Deputy Commissioner (DC) of the district where the hospital is situated, is responsible to follow and implement the EPA orders. The Environmental Protection Tribunal (EPT) is constitute by EPA for whole province. The previous Environmental Protection Tribunal (EPT) was dissolved and the new one was not constituted yet.

The EPA director and the inspectors also told that the government does not allocate any separate waste dumping site and landfill for incinerated ash and residues and infectious healthcare waste. The water and sanitation services Peshawar (WSSP) is planning to allocate three new waste dumping sites but they were not sure if any of these three new dumping sites will be reserved specifically for the healthcare waste. The present waste dumping site is located on the ring road of Peshawar and named as ring road waste dumping site. The EPA inspectors do not visit the waste dumping site regularly to make sure that it is safe for disposal and is protected from the entry of unauthorized persons, stray animals, and birds. They visit the waste dumping site and act only when the EPA receive any complain regarding mismanagement.

5.5.4 Lack of proper waste management subject in curriculum

The lack of proper waste management subject in medical colleges, nursing schools and paramedic school's curriculum is one of the major reason for unawareness and malpractices of healthcare waste management. The government of Khyber Pakhtunkhwa and the Pakistan Medical and Dentistry Council (PMDC) has no plan to introduce separate subject of 'the

healthcare waste management safe practices in hospitals' in medical colleges, nursing schools and paramedic school's curriculum. In an informal interview, the student nurses and paramedics told that they do not know about the hospital waste management (HWM) rules 2005 and safe practices of healthcare waste management in the hospital. They further explained that they have neither specific subject in their curriculum nor have attended any training about the safe healthcare waste management and this is the main reason of unawareness and malpractices of waste in hospitals. If in the medical colleges, nursing schools and paramedic school's curriculum, the specific subject of safe healthcare waste management is included, the malpractices of hospital waste can improve up to 50% in the hospitals. All the interviewed hospital staff and student nurses and paramedics in both the Govt and Pvt hospitals agreed that the government should introduce a separate subject in medical colleges, nursing schools, and paramedic school's curriculum.

5.5.5 Knowledge, awareness, and training

The knowledge, awareness, and training level of nurses and paramedic staff and waste handling employees in both the Govt hospitals was very limited. Both the Govt hospitals provided neither the record of trainings nor any schedule of training programmes for their employees. Both the Govt hospitals are teaching hospitals. The doctors, nurses, and other paramedics staff get training from this Govt hospitals but none of the hospital provided any kind of safe healthcare waste management training or have schedule training programmes for any level of hospital employees and trainees. Lack of such kind of training leads to unawareness at all levels of the hospital staff. All the interviewed "participants acknowledged that waste segregation issues were due to lack of training of medical and other staff including sweepers and ward servants" (Kumar et al. 2010: 104). Both the Pvt hospitals provides only the basic training to the nurses, paramedics staff and waste handling staff which is not enough for good healthcare waste management practices and implementation of hospital waste management (HWM) rules 2005. Most of the waste handling staff (sanitary workers/sweepers) are uneducated or less educated. The research study conducted by Ansari et al. says that "one of the biggest hurdles of waste management is the level of education and awareness amongst the personnel, which include the nursing and housekeeping department" (Ansari et al. 2013: 47). The Mahwish et al. research study "reveals that in-spit of existence of legislation most of the staff concerned with the handling of waste of the hospitals and other healthcare establishments are not aware of it (HWM rules 2005)" (Mahwish. et al. 2013: 13). Lack of knowledge and awareness is not only present on lower level of staff but also on administration level, especially regarding the

detailed laws and regulations (hospital waste management (HWM) rules 2005). Another other study done in Pakistan supports the same results and explains that "there is lack of awareness of the management regarding detailed laws and regulations governing health care waste management" (Arshad et al. 2011: 1418). Only the Pvt (B) hospital head of the waste management department, who had worked with Environmental Protection Agency (EPA) was aware about hospital waste management (HWM) rules 2005. His knowledge and awareness of hospital waste management (HWM) rules 2005 was reflected by the better waste management in all the surveyed hospitals.

5.6 Reasons for better healthcare waste management in Pvt hospitals

Healthcare waste management is a burning issue in today's world, especially in the developing countries due to the lack of proper legislation, resources, awareness, knowledge, training and interest to deal effectively with the issue and related problems. As a developing country, Pakistan is facing the similar situation however, unlike other developing countries, it has basic legislation for healthcare waste management. In Pakistan, there is a common perception that the private healthcare facilities are better than the government/public healthcare facilities. This perception may be true in providing better healthcare treatment, services, and facilities but it may be due to the cost difference between both the sectors, as the private healthcare facilities are much expensive and are less affordable for majority of the people. The results and findings of this research study shown that the healthcare waste management practices from the point of generation until the final disposal are not much different in both sectors but slightly better in the private hospitals. The main issues and reasons for better healthcare waste management services in the private sector as compared to the public sector is different in developing countries because of the healthcare waste management is a complex issue and depend upon the legislation, availability of technology, educational, social, and economic level of the country. But according to the findings of this research study in Peshawar, most prominent and dominant reasons are; separate department for waste management, better training and awareness level, better interest of the hospital staff and the administration, speciality in field by the head of department, and resources (funds, employees, equipment's, etc.) difference.

The findings of the research show that both the sectors are almost standing on the same place regarding healthcare waste management. The reasons and issues responsible for the slightly better waste management in the Pvt hospitals are discussed in detailed below. The word 'better'

does not imply that the Pvt hospitals are following or implementing the hospital waste management (HWM) rules 2005.

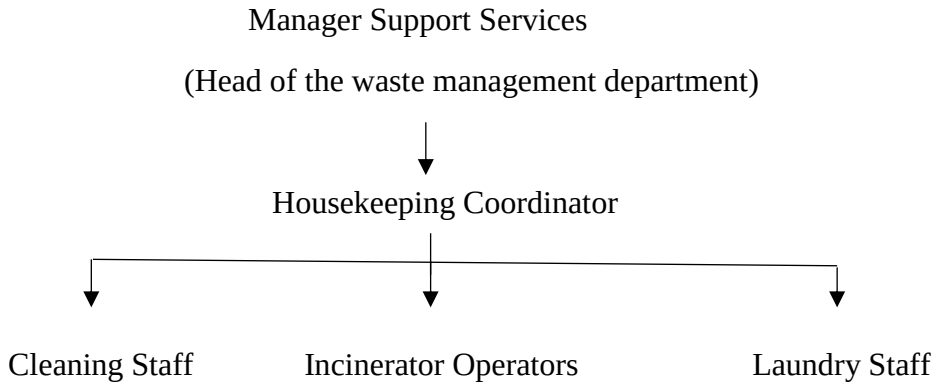
5.6.1 Separate department for waste management

In the hospital waste management (HWM) rules 2005 section No. 4 in the name of Waste Management Team included for the separate waste management department. The structure, duties, responsibilities, and meeting procedure are explained in detail in the section No. 5 and No. 6. In both the surveyed Govt hospitals, no such Waste Management Teams exist and the waste management responsibilities were distributed between different administrative heads. This shows lack of interest of the hospital administration and a major cause of malpractices of the waste management in Govt hospitals. In the Govt (A) hospital, the Chief Sanitary Inspector was responsible for the waste management. The waste handler (sweepers/sanitary workers and incinerator operator) were answerable to the chief sanitary Inspector and he was answerable to the Chief Principal Officer of the hospital. The structure of the waste management of the Govt (B) hospital was not clear. The Bio-medical engineer, HR Manager and Medical Director have mix responsibilities of waste management. In contrast to the Govt hospitals both the Pvt hospitals have its own separate waste management departments and a important reason responsible for the better waste management in the Pvt hospitals. In both the Pvt hospitals, the structure of the healthcare waste management department was different.

In Pvt (A) hospital, Manager support services was the head of the waste management department. The housekeeping coordinator reports and is answerable to the manager support services. The housekeeping coordinator supervises the three groups of employees involved in waste handling. (see Fig.5.1)

Fig. 5.1

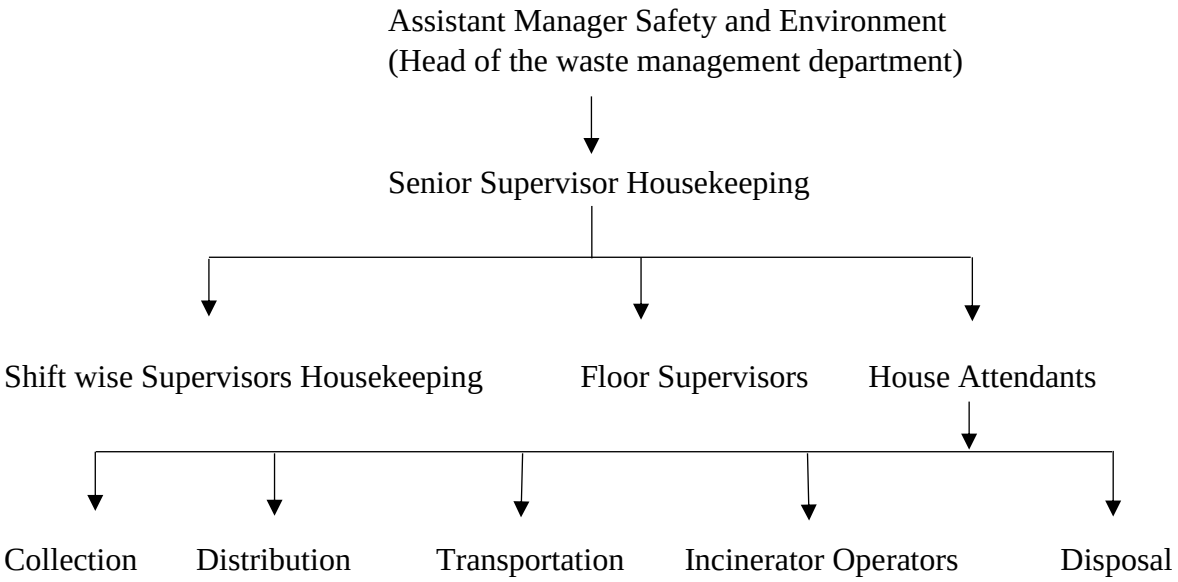
The waste management departmental structure of the Pvt (A) hospital:



The assistant Manager Safety and Environment was the head of the waste management department in the Pvt (B) hospital. The senior supervisor for housekeeping reports and is answerable to the assistant manager safety and environment. The shift wise housekeeping supervisors, the floor supervisors and house attendants report and are answerable to the senior supervisor housekeeping. The house attendant's employees were divided into more groups for collection, distribution, transportation, incinerator operators and disposal. (see Fig.2)

Fig. 5.2

The waste management departmental structure of the Pvt (B) hospital:



5.6.2 Better training and awareness level

The training and awareness level of medical waste generating staff (nurses and paramedic staff) and waste handling employees in both the Govt hospitals was very limited. Very few senior or head nurses had attended awareness workshops. The junior nurses, especially the student nurses and waste handling staff have no awareness about the hospital waste management (HWM) rules 2005 and risk associated to the malpractices of sharp and infectious healthcare waste. The waste handling and generating staff gets no proper training of the safe disposal of sharp and infectious waste. The training and awareness level of employees were better in both the surveyed Pvt hospitals. Both the Pvt hospitals arranged proper trainings and awareness programs for newly joined nurses, paramedic staff and waste handling staff before they start working. The better segregation, collection and storage practices in private hospitals were because of the arrangement of training and awareness program for the employees. The

Assistant Manager Safety and Environment of the Pvt (B) hospital told during interview that the speedy change of main waste generating staff (nurses and paramedics staff) due to different reasons is a primary reason of ineffective medical waste management in the Pvt hospitals. Instead of speedy change in the staff, the Pvt hospitals are still better than Govt hospitals regarding training and awareness of their employees.

5.6.3 Better interest of the hospital staff and administration

The lack of interest by the hospital staff and administration leads to the malpractices of healthcare waste in both the Govt hospitals. According to the Kumar et al. study, "the administration was least interested in directing staff to segregate the waste and there was no proper supervision for waste management practices in all of the hospitals" (Kumar et al. 2010: 104). This study further explains that "there was minimal supervision and guidance from the hospital management for implementing the HCWM practices" (Kumar et al. 2010: 105). In both the Govt hospitals, lack of interest in waste management by the hospital staff and administration was due to the permanent employment for the appointed position. The accountability procedure is also much complicated, and their promotions in employment are not related to their performance. In contrast, the Pvt hospitals staff and the administration takes interest in healthcare waste management (HCWM) because the private owner privately hires them and their removal from position and accountability procedure are not much difficult and complicated for the owner. The second reason for the interest is that their promotion in employment and increase in salary is related to their performance. This correlation in promotion, salary and performance create interest of the employees, so they try their best to perform more than their capacity.

5.6.4 Speciality in field by the head of department

The head of the department's speciality in the field makes a clear difference in the performance of the department. The Pvt hospitals haired their administrative staff, especially the waste management head based on their experience and speciality in the field. The Pvt (B) hospital head of the waste management department was a postgraduate in environmental studies and had worked with the Environmental Protection Agency (EPA) and the Pvt (A) hospital head of the waste management department was graduated in business administration. This difference of the administrative heads in the field speciality is another reason for better waste management in some areas of the healthcare waste management in both the Pvt hospitals. On the other hand,

in the Govt hospitals the administrative staff are doctors and promoted to the high administrative posts on seniority bases rather than speciality basis. They do not have any degree, diploma, or certificate in the field of waste management. The research study in eighteen different hospitals of Pakistan, has shown the same findings and explains that the person responsible or the designated person for healthcare waste management have failed to show any kind of trainings/diplomas except one who has diploma and two have attended WHO workshops (Hassan et al. 2012). This lack of speciality in the field by the head of department leads to the lack of awareness and the lack of interest, which is clear from the findings of this study.

5.6.5 Resources difference

In Pakistan, health is a public welfare sector and the government is responsible for the provision of the healthcare facilities to every citizen. The government is also responsible for resources supply to the Govt hospitals. In the Govt hospitals, the consultations with doctor and specialist are free and only costs ten rupees (Rs.10) for the prescription paper and other nominal charges for different treatments (blood tests, urine tests, X-rays, ultra sounds, ECG, MRI, Cite-Scan, etc.). The admission fee for treatment in the Govt hospital is nominal and charged for once until the treatment finished and the patient is discharged. Therefore, the public hospitals do not generate enough revenue to meet their expenses and are dependent on the government budget allocation. In interview, the heads of both the Govt hospitals told that the budget allocation is less and not enough to meet the expenses. The first issue is that there are limited resources for medical waste management in the Govt hospitals. The second is limited employees for waste management and handling in the Govt hospitals. The third one is lack of the proper waste management related technologies and equipment. The first and third issues are correlated.

In contrast to the Govt hospitals, the Pvt hospitals are owned by private owners and run for profit. A very few and economically sound people afford treatment in the private hospitals because of high expenses. They have no budget support from the government side, that is why they charge high fee for the treatment to meet with their expenses and earn extra. The private hospitals have no issue of funding because additional cost can be shifted to the patient and they can also hire additional employees according to their need. The private hospitals can manage and provide all kind of safety and protective gears to all the employees related to the handling of healthcare waste and the technologies for better waste management. Unfortunately, despite

the availability of funding, employees and affordability of technologies, the Pvt hospitals are unable to implement fully the hospital waste management (HWM) rules 2005.

The above mentioned and discussed reasons are based upon the interviews conducted with the different hospital staff. All the interviewed employees from both Govt and Pvt hospitals agreed that the healthcare waste management (HCWM) is a complex and major issue and the above-mentioned reasons are mainly responsible for the difference in healthcare waste management between Govt and Pvt hospitals. The Pvt hospitals were better in many fields (segregation, storage, training and awareness, separate department for waste management, funds and employee's availability, field speciality of the department head, etc.) of waste management as compared to the Govt hospitals but still are unable to fully implement and practice the hospital waste management (HWM) rules 2005.

6. Conclusion

Healthcare services provided by the hospitals generate both infectious and non-infectious waste. In general, large percentage (85%) of healthcare waste has similar nature as that of municipal solid waste and it is classified as general waste. The remaining (15%) healthcare waste is considered infectious and a major risk to human health as well as environment. To protect both human beings and environment, safe management of healthcare waste is important and necessary. Against this background, the main objective of this study was to observe and understand the current practices and implementation status of national regulation for healthcare waste management. The study also focused on overall causes of malpractices related to waste management in both public and private hospitals. The study was conducted in Peshawar the capital city of Khyber Pakhtunkhwa province. The selection of hospitals was based on number of beds, patients, daily visitors, departments, and wards

Currently the practices for healthcare waste management (HCWM) vary from hospital to hospital. Overall, implementation status of the hospital waste management (HWM) rules 2005 was poor in both the public and private healthcare facilities. The waste segregation, on-site collection and transportation, storage, on-site disposal (incineration), off-site collection and transportation and final disposal practices in all the surveyed hospitals was very poor and not according to the hospital waste management (HWM) rules 2005. Although, the situation in both the private hospitals was better in some fields of waste management as compare to the public hospitals, however, the word "better" does not imply that the private hospitals are following or implementing the hospital waste management (HWM) rules 2005 in letter and spirit.

The overall reasons for mismanagement and malpractices of hospital waste are; a) lack of government interest, b) lack and complication of rules in hospital waste management (HWM) rules 2005, c) lack of proper check and balance system, d) lack of proper healthcare waste management (HCWM) curriculum in medical colleges, nursing schools and paramedic school's curriculum, and e) limited knowledge, awareness, and training of hospitals' employees and administration. The limited knowledge regarding waste management particularly among nurses, paramedics and waste handling staff in public hospitals was of serious concern. The administration in both the public hospitals was less aware about the hospital waste management (HWM) rules 2005. The lack of proper and simple monitoring and supervision system further exacerbate the situation. The present system of check and balance is quite complicated, which according to the Environmental Protection Agency's (EPA)

inspectors makes the accountability of the hospitals difficult. Similarly, the limited scope and complicated nature of the regulations in hospital waste management (HWM) rules 2005 makes the compliance challenging. The hospital waste management (HWM) rules 2005 were formulated for public hospitals and many sections are not practically implementable in private hospitals.

The most prominent reasons for relatively better healthcare waste management (HCWM) in the Pvt hospitals in comparison to public hospitals of Peshawar are the separate department for waste management in hospitals, better training and awareness level of employees, interest of the hospital staff and the administration, speciality in the field by the head of department, and resources (funds, employees, equipment's, etc.) difference. Nevertheless, the three important reasons, which make the private hospitals better then public hospitals, include the separate departments, in which the responsibilities are mention and distributed from top to bottom. The second is the arrangement of basic training for the newly joined nurses, paramedics, and waste handling staff before started working. The third one is the speciality in the field, by the head of waste management department. It was this reason that Pvt (B) hospital was better in waste management in all the surveyed hospitals because of the speciality of the head of waste management department.

The proper documentation of the healthcare waste is necessary for both the effective and better waste management and for future planning. The proper and immediate training and awareness programmes should be started for all levels of hospital staff, especially in the public hospitals. The government needs to revise and amend the hospital waste management (HWM) rules 2005 to make it simple, effective, and practically applicable in both public and private hospitals. The curriculum of the medical colleges, nursing schools and paramedics' school also needs revision to include a specific subject on safe healthcare waste management, according to the World Health Organization (WHO) standard. The Environmental Protection Agency (EPA) needs regular monitoring of the final waste disposal site to ensure the safe disposal of waste and should also provide a separate landfill site for the incinerated ash and residues waste of hospitals. Last but not the least government must also establish a proper, effective, and simple check and balance system for hospitals and its waste management. By proper implementation of the findings of this study, the healthcare waste management (HCWM) practices will improve not only in Peshawar, but also in all the cities of Pakistan.

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Appendix

Simi-structured Interview guide for Hospital waste management in the city of Peshawar Khyber Pakhtunkhwa, Pakistan

General Information:

Hospital name: ----------
Department: ----------
Interviewee Occupation: ----------
Gender: ----------

Questioner for Administration/ Department Head:

Q1. Do you know about the hospital waste management (HWM) rules 2005?

Q2. Do you have any degree, diploma, or certificate in waste management?

Q3. How many kilograms (kgs) medical waste is being generated in this hospital per-day?

Q4. What types of healthcare wastes are generated in this hospital?

Q5. What are the type and number of wards/department in this hospital?

Q6. Do you have or keep any record of waste generation in this hospital?

Q7. What is the quantity of risk and non-risk waste generation in this hospital?

Q8. Does this hospital has weighting system of the hospital waste?

Q9. Does this hospital has central storage facility and what is the capacity of this central storage?

Q10. How you disposed the hospital waste and where?

Q11. Do you have a separate healthcare waste management team or department and how they work?

Q12. Who is responsible for the hospital waste management plan and what are their strategies to implement it effectively?

Q13. Do you provide any kind of training to hospital staff and administration regarding the safe disposal of healthcare waste?

Q14. Do you have any recycling practice in this hospital and which kind of items is recycled?

Q15. What are the main reasons of malpractices and non-implementation of hospital waste management?

Q16. Do you have any suggestions how to improve the hospital waste management?

General Information:

Hospital name: ----------

Department: ----------

Interviewee Occupation: ----------

Gender: ----------

Questioner for Nurse:

Q1. Do you know about the hospital waste management (HWM) rules 2005?

Q2. Is there any subject related to healthcare waste management in Nursing College's curriculum and how much is it important?

Q3. Do you receive any training regarding safe disposal of hospital waste?

Q4. How you dispose the medical waste, in separate bins with colour cods or mix in one bin?

Q5. Do you have initial facility for disposal of sharp and infectious waste (needles, syringes, blades, injection bottles etc.) before final disposal?

Q6. Does it come under the responsibility or job description of nurses to follow strictly the health care waste management from generation to disposal?

Q7. Does the Doctors take or share the responsibility of healthcare waste management with them?

Q8. How nurse can play a vital role in hospital waste management?

Q9. What are the main reasons of mismanagement and malpractices of healthcare waste?

Q10. What are your suggestions to improve the hospital waste management?

General Information:

Hospital name: ----------

Department: ----------

Interviewee Occupation: ----------

Gender: ----------

Questioner for Sanitary worker/ Sweeper/housekeeping:

Q1. Do you know about the hospital waste management (HWM) rules 2005?

Q1. Do you know your job description or responsibilities as a sanitary worker/ Sweeper/housekeeper?

Q3. Do you get any training regarding safe collection and disposal of medical waste?

Q4. How much waste is generated in this hospital per day, do you have any weight scale for weighting of waste?

Q5. Does this hospital has central storage facility and what is the capacity of this central storage?

Q7. How you collect and transport the healthcare waste within the hospital?

Q8. The administration provides how many colours of bags?

Q9. How many types of waste bins are available in each ward and department?

Q10. What kind of trolleys do you have for waste transportation within hospital?

Q11. Do you get any protective gears from hospital side?

Q12. What are the main reasons of malpractices and non-implementation of hospital waste management?

Q13. Do you have any suggestion to improve the hospital waste management?

General Information:

Hospital name: ----------
Department: ----------
Interviewee Occupation: ----------
Gender: ----------

Questioner for Bio-medical Engineer

Q1. Do you know about hospital waste management (HWM) rules 2005?

Q2. Do you get any kind of training regarding hospital waste management?

Q3. Does this hospital has a proper weighting system and keeping record of healthcare waste?

Q4. What types of healthcare wastes are generated in this hospital?

Q5. What kind of waste disposal method is being used in this hospital?

Q6. What are the main reasons of malpractices of healthcare waste management?

Q7. What are the main reasons responsible for the difference regarding healthcare waste management between public and private hospitals?

Q8. Do you have any suggestions how to improve the hospital waste management?

General Information:

Hospital name: ----------
Department: ----------
Interviewee Occupation: ----------
Gender: ----------

Questioner for Incinerator operator

Q1. Do you know about hospital waste management (HWM) rules 2005?

Q2. Do you get any kind of training regarding safe hospital waste management?

Q3. Do you have any degree, diploma, or certificate in incineration operating?

Q4. Does hospital provide the safety gears for safe working?

Q5. How you receive the hospital waste, mixed from before or separate?

Q6. Are you satisfied with the incinerator and does it work properly?

Q7. How the WSSP collect the incinerated ash and residues and where they finally dispose it?

Q8. Which kind of vehicles are used by WSSP and sub-contractors for transporting of incinerated ash and residues?

Q9. What are the main reasons of malpractices of hospital waste?

Q10. Do you have any suggestions how to improve the hospital waste management?

General Information:

Name: ----------
Department: ----------
Interviewee Designation: ----------
Gender: ----------

Questioner for Environmental Protection Agency (EPA) staff

Q1. Do you know about hospital waste management (HWM) rules 2005?

Q2. What is the EPA role in hospital waste management?

Q3. How they monitor the hospitals to implement the hospital waste management (HWM) rules 2005?

Q4. Do they have enough resources to implement the hospital waste management (HWM) rules 2005?

Q5. Does EPA have any plan to revise or amend the hospital waste management (HWM) rules 2005?

Q6. Do you properly monitor the waste dumping sites?

Q7. Do you have any record regarding the monitoring of the hospitals?

Q8. Do you have any record or document regarding healthcare waste management?

Q9. What are the main reasons of mismanagement and malpractices of hospital waste?

Q10. Do you have any suggestions how to improve the hospital waste management?

General Information:

Name: ----------
Department: ----------
Interviewee Occupation: ----------
Gender: ----------

Questioner for Water and Sanitation Services Peshawar (WSSP) workers and sub-contractor workers

Q1. Do you know about hospital waste management (HWM) rules 2005?

Q2. Do you get any training regarding safe collection hospital waste?

Q3. Are you provided safety gears for safe working?

Q4. How you are dispose the healthcare waste, incinerated ash and residues?

Q5. Do you dump the hospital waste in open dumping or have separate disposal site?

Q6. Do you dispose the hospital waste to the domestic waste dumping site?

Q7. Do you have any instruction to burn the waste in open waste dumping site?

Q8. What are the main reasons of mismanagement and malpractices of hospital waste?

Q9. Do you have any suggestions how to improve the hospital waste management?

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