

Investigation on Clinical Wastage Issues of Hyderabad City

Ammara Kaynat¹ Ali Raza Khoso²

¹ NCA Lahore, Pakistan,

² School of Civil Engineering, Faculty of Engineering,
Universiti Teknologi, Malaysia

Abstract: Increasing population & urbanization enhanced several facilities for public; health facilities are among such top priority of human being. Beside these health facilities, an immense amount of clinical waste is generated everyday throughout Pakistan. There are more than 150 health facilities in Hyderabad City only. As per past findings, the total clinical solid waste generation rate in Hyderabad city is 8 tons/day. Moreover, the clinical waste management has become a critical environmental concern in the city. This study illustrates the existing clinical waste management issue of Hyderabad city including; classification of different types of clinical waste, its generation rate and contribution of public & private organization involved in clinical waste management. The research also focusses on generated amount of recyclable and non-recyclable clinical wastage. To investigate the data, three major hospitals of Hyderabad city were targeted i.e. Rajputana hospital, Civil hospital & Bhattai hospitals. The data collection involves various interviews with the authorities of these hospitals, and unstructured interview with personnel involved in the management of clinical waste. Furthermore, several personal visits on waste disposal sites of the hospitals took place to have more data. This study results in unfolding several issues involved in clinical waste and the concern problems of the facilities. This investigation is a road map for the concerned authorities to pay attention over these serious growing issues of the city and the country, and resolve the consequences of such wastages on human health.

Keywords: Clinical wastage, Clinical waste management, Hyderabad.

I. INTRODUCTION

Recently, not only Pakistan but world too has practiced rapid growth in population which ultimately results in generation of waste at extraordinary level. Collection & transportation, treatment & disposal of waste is of great challenges for government, organizations and other institutions. There are several types of solid wastes which are classified into household waste, industrial waste and Clinical waste. It is supposed to be the most dangerous wastes in the world. It describes as waste that is generated during diagnosis, monitoring, and immunization or treatment of human beings or animals. It includes viruses and bacteria, as it is the result of medical process, which can cause diseases. Huge amount of clinical wastage is dumped untreated. A patient generates 1.5-2 kg of waste per day irrespective of the wards [1] governed by the "bed occupancy". On a normal day almost 75% of hospital beds are occupied by patients [1, 2]. This waste includes non-risk & risk waste. Health facility is one of the peak points as the urbanization and population growth promote facilities in private & public sector. A bulk amount of clinical waste is generated every day in Hyderabad. Moreover, it has become a critical concern all over the world. There are more than 150 health care centers and hospitals in Hyderabad which lack a proper waste management plan. The management of clinical waste poorly managed. The condition of maximum health centers is poor because their owners are found to be careless towards the proper disposal of medical waste. In this regard public awareness and training of staff are mandatory for sound medical waste management. There is no proper disposal of non-renewable clinical wastage and no wastage plan for renewable clinical wastage which is the major cause of several infectious diseases for public. Hyderabad being under developing city, faces several issues in which the overall condition of hospitals either government or non-government is poor, the issues which we focused include waste management, as the problem starts from wards, where patients do not use bins and throw the waste at floor, and then due to improper management the sweepers and other staff did not transport the waste on daily basis and hence bins are over run, which create smell and it become the center of more diseases, moreover the Infectious and liquid waste is also not managed properly without any consideration of amount of waste production the disposal and management of these waste is dispose and managed.

II. CLINICAL WASTE & ITS TYPES

Clinical wastage is the type of wastage produces by clinics, hospitals, pathological laboratories, diagnostic & health care centers. WHO (1999) categories clinical wastes in 9 categories, but it is extremely difficult to conduct such survey in the context of the Hyderabad City Hospitals. So, it is classified in four categories. They are:

A. Infectious Waste

Waste produced by infectious wards & materials or equipment contaminated with blood & derivatives, other body fluids or excreta. Blood soaked dressings & bandages, surgical gloves, laboratory culture, swabs from laboratories, contaminated blood clots and glassware material.

B. Sharp

All hypodermic needles and syringes, intravenous needles, ampoules, sharp blades, lancelets, broken glassware, broken glassware and vials without content are included in this category.

C. Plastic Type Waste

This includes tubes, bags, syringe, ampoule vial, etc.

D. General Waste

Food waste, office paper, packaging, plastics, cardboard, non-contaminated plastic or metal, cans or glass, fall in this category.

III. MAIN OBJECT OF THE SYUDY

The main objectives of the study are as follows: (1) to calculate the amount of clinical waste generated from 3 main hospitals of Hyderabad (2) to investigate the current clinical waste management, dumping systems and issues in Hyderabad city (3) to bifurcate the quantity of recyclable and non-recyclable clinical waste

IV. RESEARCH METHODOLOGY

Author adopted several methodologies to research the desire proposal, these methodologies include survey of Hospitals, interview with the waste management officer, un structured questionnaire with the staff of waste management of Hospitals. All wards of 3 hospitals were visited. Methods of waste collection, segregation, transportation, dumping sites, both on-site & off-site disposal techniques are surveyed. Existing waste management practices are analyzed another method which Author adopted, include the research papers, author read several research papers relevant to the proposed study of Clinical waste management. Hyderabad is the 2nd largest city in Sindh and the 8th most populated city of Pakistan, with a total area of 123 sq. mile, with a huge population of 1,732,693 (2017 census). With more than 48 Hospitals and more than 85 small Health care centers, from which 3 major Government Hospitals i.e. Rajputana hospital, Civil hospital & Bhittai hospitals were selected for the Study. Hyderabad generates 8 tons of clinical waste/day. The maximum part is generated through these three hospitals due to their high number of patients and facilities, the dumping site for these hospitals is mainly within the hospital premises from where the SWM transport it to the final site & the practical situation of Clinical waste management of Hyderabad is ridiculous.

V. CASE STUDIES

A. CIVIL HOSPITAL

Civil hospital is located at Hirabad, Hyderabad. Due to security measures, the administration and waste management team did not allow to take the pictures. Disposal site of civil hospital is within the hospital premises. The it is a chamber build of brick masonry along with a chimney where all the clinical (infectious) wastage is dumped 2 times a day and is burnt down to the ash, the ash is then borrowed in the earth, there is a hole dogged with in this chamber, where they drop and lay down all the ash. The chamber is a cubical with a chimney which help the smoke not to enter the premises of hospital.

B. RAJPUTANA HOSPITAL

Rajputana hospital also known as Wali Bhai Rajputana Hospital, is located on Jamshoro road, near Agha Khan Maternal & Child Care Centre. Is the 2nd largest private hospital in Hyderabad, is 275 bedded hospital with a capacity of 500 beds, produce 110 kg total waste and according to Dr. Shakeel, from which 30 % is clinical (infectious) waste. Waste management team is associated with transportation of waste from corridors, laboratories, doctors' chambers & all the departments & wards up to their respective site from where the respective corporation work out for waste management. They produce three types of wastage. Which include infectious waste, liquid waste & solid waste. For solid waste SWM corporation is responsible for daily basis transportation of general waste from hospital up to final disposal site. Green Nexus Corporation transport all the infectious material from hospital to Karachi & for liquid waste, all the liquid waste from hospital is collected in a pit where Hypo chloride acid is added in it and make it non-infectious and then it is drain off in main sewer. The staff of clinical waste management of Rajputana hospital did not allow to survey their disposal site but Dr. Shakeel Ahmed, their Manager provided the information about the disposal site according to Dr. Shakeel the disposal site is on the back of hospital, but the site has proper approach from main road in order to maintain the transporting facility of clinical wastage. The Green Nexus Consulting company is involved in clinical waste management of Rajputana Hospital and they take all the infectious waste to Karachi, twice a week. Hence, daily SWM corporation took all the general waste to the final disposal site from temporary disposal site of Hospital. Author conducted Unstructured interview with Dr. Shakeel, which was quite helpful in unfolding the issues and wastage production rate, the main issue which was highlighted was the management, SWM corporation show careless attitude and if SWM transport & dispose all the waste daily, there will be no problem regarding waste management, according to Dr. Shakeel, 2 years ago, Rajputana was shut down just because it was not fulfilling the hygienic criteria of Clinical waste management, Green Nexus Consulting is working with hospital for infectious waste & it transport infectious waste twice a week, which means in these 3 or 4 days the infectious waste remains as it is in condition which is not un-healthy for environment.

C. BHITTAI HOSPITAL

Bhittai hospital, is located at unit # 5, a district government 150 bedded hospital, produce 160 kg total waste & 50 kg clinical wastage. They produce three types of wastage. Which include infectious waste, liquid waste & solid waste. Segregation of wastage is done at every step of hospital there are 3 bins in each ward and department with a colour coated on it i.e. red colour coated bin for infectious waste (syringes, blades, blood stained cotton or bandages), yellow colour coated for non-infectious waste (tubes, blood bag, glucose bottles etc.) & white for general solid waste. For solid waste SWM corporation is responsible for daily basis transportation of general waste from hospital up to final disposal site. Infectious and non-infectious material is burnt daily in burnt chamber and then buried down in pit. Liquid waste is firstly treated into dis-infectious liquid through addition of 1% hypo chloride solution and then drain down in general drains. At Bhittai hospital, author conducted interview with WM manager Sir Jamil Ahmed, who deal in waste management, he let author visit the site along himself, and brief all the possible information regarding waste management. Jamil Ahmed, told that they have 3 type of waste management within the hospital, one is solid waste management, second is infectious waste and last one is liquid waste, they have separate waste

management for all the three types of waste. The infectious waste like gauze, bandages, etc Hospital has developed a simple burning chamber of which have a concrete pit of 4'-0" x 4'-0" x 5'-0". This chamber is located on the back side of hospital along with a hole in land, where they bury down all the ash of burnt infectious material. They lay down all the infectious waste thrice a day in this chamber which is burnt as soon as possible in order to prevent the spreading of germs and other diseases.

VI. REVIEWING LITERATURE

Clinical waste is supposed to be reservoir of pathogens & micro-organisms & they requires appropriate, safe handling & disposal [3]. Persons involved to clinical wastage management are at risk of infections, also including those who are involved in its handling [4]. According to Department of Environment Malaysia it is common in Malaysia to mix general waste into clinical waste but this is an addition of the cost to management of the health care center and to the government [5]. It is alarming issue to combine hazardous & nonhazardous waste at hospitals & it is because of less staff training [6]. Loose clinical waste in yellow wheeled bins or improper sealing of the yellow bags create higher risk on needle stick injury and biological hazard among health care workers [3]. The World Health Organization (WHO) recognizes that in many developed countries, improper management is a significant threat to the enjoyment of human rights, which include the right to life, physical and mental health [7]. Lack of awareness & training for personnel involved in the clinical waste management are the areas which need improvement in the point of hazardous clinical wastage disposal [8]. In this regard Awareness campaign, workshops & training can promote awareness of proper handling and disposal of clinical waste management [6]. It is of great concern to focus on management and handling of hazardous hospital waste [6]. According to WHO, most of the problems which developed countries are facing now a days in context of hospital waste are due to un-awareness regarding the health issues related to complete healthcare waste management [9]. Type of health-care establishment, waste management methods, hospital specializations, proportion of reusable items employed in health care & number of patients treated/day are the factors on which medical waste generation is dependent. [10]. It is also stated that the generation rate of waste in medical departments also depend upon the social & economical status of patients. [11]. Quantity of clinical waste generation depends on national income and level of development, which vary from country to country [12]. Medical waste is infectious and dangerous too, they are serious threat to environment and the need of hour is to provide specific treatment and management prior to its final disposal [13]. In developing countries clinical waste management is still poor and it is disposed without proper supervision & experience [14]. Due to lack of knowledge and interest in safe waste disposal and absence of a budget to effectively implement safe waste disposal often medical staffs was found to generate revenue through sale of medical waste [15]. Bangladesh lack rigorous laws & regulation regarding enforced clinical waste management [16]. Waste management plan in hospitals is a significant social & environmental obligation, which requires a proper plan. Study in Bangladesh reviewed lack of knowledge & awareness about hospital waste, its management among hospital staff & its consequences for environment & human [17]. Study at Dhaka revealed that lack of willingness at health policy and law levels among the concerned persons [18]. In our study concerning HWM, it was found that officials thought that safe & secure waste disposal along with its proper segregation is an important issue. Similar study in America reported that majority of the officials, not only considered HWM an important issue, but also aimed at reducing 67% of the waste by switching to less waste producing products. [19] Our study showed that the waste generation rate in hospitals of Hyderabad vary from hospital to hospital kg/bed/day. In Pakistan, a study by Mahmood-ur-Rahman from Rawalpindi General Hospital, stated that average waste generation rate is 1.35 kg/bed/day. Another study of Distt. Hospital, Kusur, revealed that the average waste generation is 2.5 kg/patient/day [20] The rate of hospital waste generation in USA was reported as 5.9 to 10.4 kg/bed/day, In Europe it was 3-6 kg/bed/day. In a under developed country in a rural hospital, in sub-Saharan Africa the daily production of solid waste ranged between 0.3 to 1.5 kg/bed/day. [21], [22] It was found in Peshawar that 93.34% of the hospitals do separate the waste into risk and non-risk types and these are segregated at the point of generation in most of the cases, it is important to do so, if not, can lead to spreading of different infections.[23],[24] As reported in an African hospitals they were quantifying and segregating medical waste into infectious waste and non-infectious waste.[25] More than 30% of the hospitals were not labeling the waste which is essential for their proper disposal according to their nature, source & level of biohazard. The rest % of hospital labeled the waste according to date/content or source etc. On the contrary, a study performed in America showed that most of the hospitals used color coding to segregate their wastes. They also used purpose designed containers especially for sharps leading to a low percentage of disposal related injuries i.e. only 20% at a New York teaching hospital. [26], [27]. This is in contrast to the fact that most of the people while knowing & being aware of medical waste & its management only some of these considered the segregation and safe disposal of waste a proper issue. [28] Even though the "Hospital waste management rules 2005" state that waste storage facility should present with in the hospitals and WMO should oversee appropriate use of such facility and ensure correct method of transportation of waste, and a survey decode that daily monitoring by the WMO was done by 40% of hospitals. Storage facility was found in only 53% of the hospitals and recording of waste transportation was done in only 47% of the cases. [29], [30] Comparison of Hospital waste management in the hospitals of Hyderabad, Sindh with other cities of different provinces in Pakistan revealed that the overall scenario is similar in situation of waste generation, practices of hospital waste disposal, attitude of sanitation labor, personal protective devices usage at the time of handling & managing the waste.

VII. FINDINGS & ANALYSIS

Following table shows all the collected data from all the three hospitals.

Table. 1. Analysis of Hospitals

SERIAL #	HOSPITAL	# OF BEDS	GENERAL WASTAGE /DAY	HAZARDOUS WASATGE/ DAY	TOTAL WASTAGE/DAY	WASTE GENERATION /BED/DAY
1	CIVIL HOSPITAL	900	530 kg	226 kg	756 kg	0.84 kg/bed
2	WALI BHAI RAJPUTANA HOSPITAL	275	80 kg	30 kg	110 kg	0.0036 kg/bed
3	BHITAI HOSPITAL	150	110 kg	50 kg	160 kg	0.9375 kg/bed

VIII. QUANTITY OF RECYCLABLE & NON-RECYCLABLE WASTE:

Through all the three hospital's survey and through interview of concern persons, the author concluded the quantity of recyclable & non-recyclable waste quantity, producing from these hospitals on daily basis, following table shows the quantity of each type of waste:

Table. 2. Quantity of clinical waste type.

WASTE TYPE	QUANTITY
RECYCLABLE	197 kg
NON- RECYCLABLE	109 kg
TOTAL WASTE	306 kg

IX. CHECKLIST FOR SURVEYED HOSPITALS

At the time of survey, the following features were focused in hospitals, the following table shows all the focused features of hospitals for the data collection of clinical wastage.

Table. 3. Features of clinical waste management at hospital.

	CIVIL HOSPITAL	RAJPUTANA HOSPITAL	BHITAI HOSPITAL
Cleanliness			
General Wards	Basics	Basics	Basics
Wards	Basics	Basics	Basics
Departments	Basics	Basics	Basics
Waste management (WM)	Yes	Yes	Yes
Segregation at site wards/departments	Yes	Yes	Yes
Wastage containers	Basic	Basic	Basic
Proper transportation up to dumping site (Trolley/cart)	Yes	Yes	Yes
Initial storage in wards	No (only bins)	No (only bins)	No (only bins)
Proper dumping site	Proper area but not storage facility	Proper area but not storage facility	Proper area but not storage facility
Waste segregation at dumping site	Yes	Yes	Yes
Transportation to final site	Yes	Yes (2 times a week)	Yes (daily)
Final disposal site	Yes	Yes	Yes
Incinerator facilities	Yes	Yes	Yes
Waste Management Staff	Yes	Yes	Yes
Training of waste handling	Yes	Yes	Yes
Protective gears	Yes (not every single time)	Yes (not every single time)	Yes (not every single time)
Knowledge about managing waste	Yes	Yes	Yes
Training sessions	No	No	No
Medical examine	No	No	No
Treatment of infectious waste	Yes	Yes	Yes
Disinfected before disposal	Yes	Yes	Yes
Special staff for handling	Yes	Yes	Yes
Incident report procedure	No	No	No

X. PROPOSED CLINICAL WASTE MANAGEMENT PLAN

Author proposed plan for all the three types of waste & some special considerations to be taken for clinical waste management. Proposed plan for clinical waste management is described below:

A. Waste management plan

Solid waste of hospitals should be separated from other types of waste as it should be treated differently in order to prevent the hazardous environmental effect of solid waste. The following chart shows the complete proposed process of solid waste management from collection up to final disposal site.

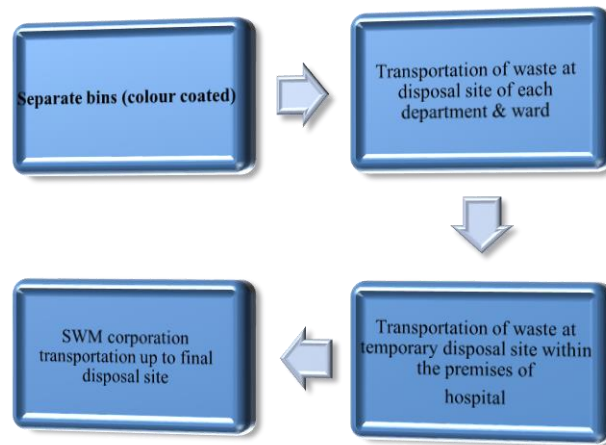


Fig. 1: Solid waste management plan

B. Infectious waste management plan

Infectious waste is more harmful than any other type of waste, so require more practical and hygienic approach towards the management, in this regard the following chart shows the process of infectious waste management, which not include only its disposal but also the process of dis-infecting in order to make sure the hygienic condition of hospital premises.

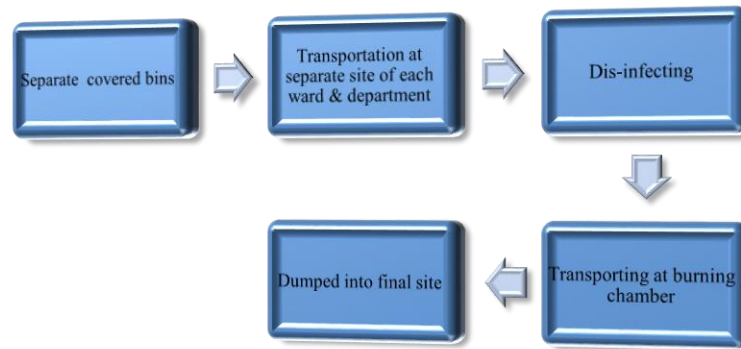


Fig. 2: Infectious Waste Management Plan

C. Liquid waste management plan

Liquid waste is also the part of hospital waste, which if not treated well, can be more hazardous than any other type because in last it has to be the part of our main sewerage lines. Following chart shows the liquid waste management plan for hospital:

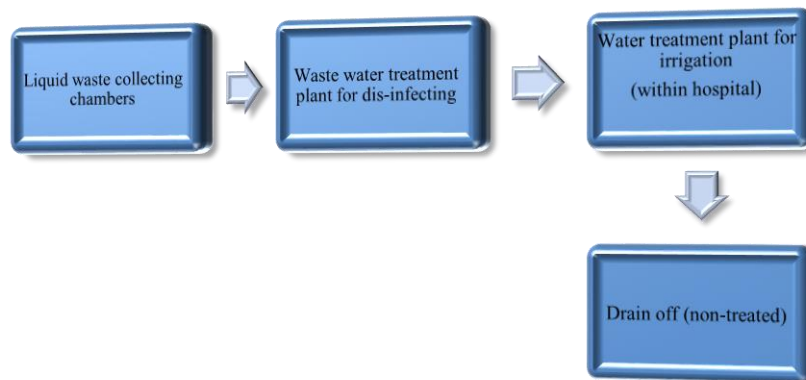


Fig. 3: Liquid waste management plan

D. Special Considerations

All the three waste should be managed in proper way, some other special measures should be considered by hospital management staff in order to nearly confirm the hygienic environment of hospital in order to decrease the risk of spreading of disease. These special considerations are listed below:

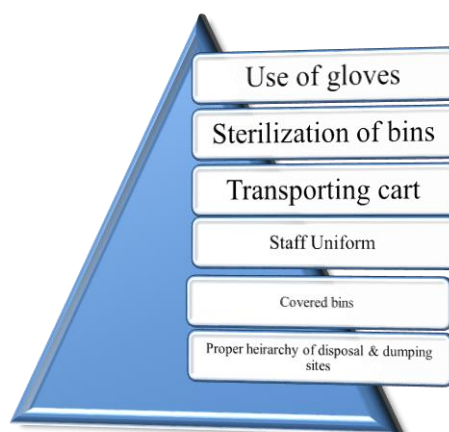


Fig. 4: General special considerations for Clinical waste management

XI. CONCLUSION

The research paper was carried out to find out Hyderabad's 3 major hospital's waste generation rate and the current practice to manage the clinical waste, and the author then go through 20 research papers that reported on relevant clinical waste management plan & it is stated that number of patients & beds, bed occupancy rate and type of hospitals were the most significant prediction factors in clinical waste generation. These factors than help out the author to estimate the generated amount of waste through survey at different time & days at hospital. Obtained results are useful for healthcare facility and CWM service providers and also for researchers to develop and offer suitable models for clinical waste management plan. It also concluded that whatever the management plan is, without implementation none of the plan is workable. The findings of author suggested some of the advices for staff & some with patients and other authorities these suggestions include that the awareness of staff is important in ensuring the clinical waste management. This examination was for the most part completed to have clear thought regarding the clinical waste administration practices and measure of wastage rate in Hyderabad city. Be that as it may, the current clinical waste administration arrangement of Hyderabad is neither agreeable nor sufficient. Hyderabad is deficient with regards to usage of law and direction of clinical waste administration no corrective activity against inappropriate transfer of dangerous waste. Along these lines, it is important to direct proper laws and usage for its administration. Strict law and request ought to be made or ought to enhance the old framework. Non-Governmental Organizations ought to be required to overhaul the waste transfer framework, appropriate consideration is required for finish squander administration plan. It is the interest of sound society to have clinical administration framework which is protected. Sterile and financially savvy measures must be taken for the last transfer and treatment of the dangerous waste. Individuals need to think about the antagonistic impact of strong waste in condition. The further research in such manner can be directed for the evaluated amount of creation of each kind waste, its reusing procedure, estimation of fluid waste and its treatment plant, with a specific end goal to keep up the chain of importance in order to maintain the hierarchy of hospital waste management.

XII. ACKNOWLEDGE

Nothing is possible without Allah, I would like to thanks Allah for facilitating me with a bulk of great mentors and co-operative parents who make my every effort successful.

REFERENCE

- [1]. Pakr k. Hospital waste management. In Parks text book of preventive and social medicine. M/s Banarsidas Bhanot Publishers Jabalpur. 2010; pp699-700.
- [2]. Mathur P, Patan S, Shobhawat S. Need of Biomedical Waste Management System in Hospitals - An Emerging issue – A Review. *Curr World Environ* 2012; 7(1):117-24.
- [3]. WHO, "Fact Sheet: Wastes from Health-care Activitie," New Delhi, 2007.
- [4]. MOH, "Sharps Injurry Surveillance Manual," Putrajaya: Occupational Health Unit, Disease Control Division, 2007.
- [5]. DOE, "Guidelineson the Handling and Management of Clinical Wastes in Malaysia," Putrajaya: Ministry of Natural Resources and Environment, 2009.
- [6]. M. Askarian, M. Vakili, and G. Kabir, "Results of a Hospital Waste Survey in Private Hospitals in Fars Province, Iran," *Waste Management*, vol. 24, issue 4, pp. 347-352, 2004.
- [7]. C. Georgescu, "Report of the Special Rapporteur on the Adverse Effects of the Movement and Dumping of Toxic and Dangerous Products and Wastes on the Enjoyment of Human Rights," United Nations, 2011.
- [8]. P. Agamuthu, *Solid Waste: Principles and Management*, Kuala Lumpur: Perpustakaan Negara Malaysia, 2001.
- [9]. WHO, "Fact Sheet: Health-care Waste Management," New Delhi, 2011.
- [10]. Alhumoud, J. M. and Alhumoud, H. M. (2007). An analysis of trends related to hospital solid wastes management in Kuwait. *Management of Environmental Quality: An International Journal*, 18(5), 502– 513.
- [11]. Askarian, M., Vakili, M., and Kabir, G. (2004). Results of a hospital waste survey in private hospitals in Fars province, Iran. *Waste Management*, 24(4), 347–352.
- [12]. Marinkovic', N., Ksenija, V., Natas'a, J., Aleksandar, D., and Tomo, P. (2008). Management of hazardous medical waste in Croatia. *Waste Management*, 28, 1049–1056.
- [13]. Hassan, M. M., Ahmed, A. S., Rahman A. K. and Biswas, K. T. (2008). Pattern of medical waste management: existing scenario in Dhaka City, Bangladesh. *BMC Public Health*.
- [14]. Pathak, Sati. (1998), Management of hospital waste: A Jaipur scenario, Proceedings of National workshop on management of hospital waste, Jaipur.

- [15]. Dutta, Subijoy. (1998), Best practicable management of medical waste in India, Proceedings of National workshop on management of hospital waste, Jaipur, India.
- [16]. Akter, N. (2000), "Medical Waste Management: A Review", Environmental Engineering Program. School of Environment, Resource and Development, Asian Institute of Technology (AIT).
- [17]. Survey Report, Executive Summary. Hospital Waste Management in Dhaka City - Prism Bangladesh.
- [18]. Pattern of Medical Waste Management: Existing Scenario in Dhaka City, Bangladesh. MBMC Public Health 2008,
- [19]. The World Bank. Health Care Waste Management in India, Lessons from Experience. Bekir Onursal, the Publisher, the World Bank, October 2003
- [20]. Mujahid Wazir, Iqbal Ahmad Khan, Shujaat Hussain, Ayaz Hussain Qureshi, Shaukat Mahmood Qureshi, Muhammad Ashraf Chaudhry. Hospital waste management in a tertiary care Army hospital.
- [21]. Khairun nesa, M.A Quaiyum, Barkat-e-Khuda. Waste management in healthcare facilities: a review. [WP144, 2001]. ICDDRDB: Centre for Health and Population Research .Mohakhali, Dhaka 1212.
- [22]. United Nations Environment Programme. Strategy on Biomedical (Healthcare) Waste Management. Fonner Yugoslav Republic of Macedonia, Skopje,
- [23]. January
- [24]. Ngwuluka Ndidi, Ocheke Nelson, Odumosu Patricia and John Sunday. Waste Management In Healthcare Establishments Within Jos Metropolis,
- [25]. Nigeria.
- [26]. Patience Aseweh Abor, Anton Bouwer, (2008) "Medical waste management practices in a Southern African hospital". International Journal of Health
- [27]. Care Quality
- [28]. S. V. Manyele, T. J. Lyasenga. Factors affecting medical waste management in low- level health facilities in Tanzania. African Journal of Environmental
- [29]. Science and Technology Vol. 4.
- [30]. Nepal Forum of Environmental Journalists. Public Information and Awareness-Raising on Unintentionally Produced POPs from Medical Waste, May
- [31]. 2006.
- [32]. Dr Geeta Mehta. Infection Control and Health Care Waste Management in the Kingdom of Bhutan. A Mission Report, World Health Organization,
- [33]. Regional Office for South East Asia (SEARO). May 2005.
- [34]. www. Whobhutan. Org/.. /HealthInformationInfectioncontro 1. Pdf
- [35]. Govt. of Pakistan, Ministry of Environment. Brief on Environment Policy and Legal Framework Islamabad, 3rd August, 2005, notification,
- [36]. Govt. of Pakistan, Ministry of Environment. "Hospital Waste Management Rules 2005, under the Environmental Protection act, 1997 brief on Environment Policy and Legal Framework.