

Managing the healthcare solid waste in selected Districts of Punjab, Pakistan

Junaid Habib Ullah¹, Khurshed Ahmad², M. Amanullah Khan³

ABSTRACT

Objective: Hospital and other health care facilities (HCFs) are known to generate lot of waste for which its management is a matter of considerable public health and environmental concern. The study was undertaken to describe the current practices, gaps and quantify the load of health care solid waste.

Methodology: Out of one hundred and fifty health care facilities (HCFs) in Punjab, the largest province of Pakistan, a sample of fifteen (HCFs) was taken from a few selected Districts, to include six large hospitals and nine without indoor facilities.

Results: Only 40% of studied institutions had some program to dispose-off the waste. Even these programs were deficient in many areas and could hardly be considered as scientific. One third of institutional personnel interviewed had proper awareness or existence of a training program. Only one institution had some concept of taking safety steps from infectious materials.

Conclusion: The process of solid waste collection, storing, transporting and final disposal was highly inefficient in almost all the institutions. No regulatory body or system of waste was in place in any of the hospitals. There was no allocated budget in 27% of the hospitals for covering the cost of waste disposal. An average of 0.3 kg/bed/day of solid unsafe waste demands a systematic program of its disposal, failing which serious environmental hazards would develop for within and surroundings communities.

KEY WORDS: Hospital Waste Management, Segregation, Collection, Disposal, Risk Factors, PCBs, Dioxin, Incinerator, Hepatitis B and C, Tertiary level and Health Surveillance.

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1. Junaid Habib Ullah, M. Phil (Environmental Mng.), M. Sc. (Quality Mng.), M. Sc. (Physics), Post Graduate Dip. (Health Mng.), Director Hospital Waste Management, Shalamar Hospital, Lahore, Pakistan.
2. Prof. Dr. Khurshed Ahmad, Prof. of Environmental Management, Ph.D., National College of Business Administration & Economics Gulberg Lahore, Pakistan.
3. Dr. M. Amanullah Khan, B.Sc., MBBS, DPH, M.P.H & T.M (USA), FCPS, Ph.D. (USA), Prof. of Community Medicine, Fatima Memorial Hospital System, Lahore, Pakistan.

Correspondence:

Junaid Habib Ullah,
Director Hospital Waste Management,
Shalamar Hospital, Lahore - Pakistan.
E-mail: junaidhabibullah@yahoo.com

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INTRODUCTION

Hospital waste (HW) generated from healthcare facilities is very heterogeneous in nature and often contains some infectious elements. It is essential that disposal of the waste is conducted safely.¹ Carelessness in the management of this waste may spread infections and contaminate the surrounding environment.² In March 2009, 240 people in the Indian state of Gujarat contracted hepatitis B following medical care delivered with previously used syringes, later discovered to have been acquired through the black market trade of unregulated health care waste.³ In October 2008, the byproduct of a mass vaccination campaign of 1.6 million against polio were discarded into the local municipal waste in Kabul, Afghanistan, causing infectious injury to individuals scavenging landfills for reusable items.⁴

Hospital waste includes all the waste generated by health care establishment like hospitals, medical and biomedical research facilities, first-aid posts and sick bays, blood bank and collection centers, funeral and ambulance services, transfusion centers, mortuary and autopsy centers, biotechnology laboratories and institutions, animal research and testing laboratories and also the waste arising from treatment in the home. Generally HW is categorized into infectious, pathological, pharmaceutical, chemical, genotoxic and radioactive wastes.⁵ Waste generation depends on numerous factors such as established waste management methods, type of hospital establishment, hospital specialization, proportion of reusable items employed in hospital, and proportion of patients treated on a day-care basis.⁶ In Germany, about 500,000 needle stick injuries occur annually among health care workers (HCWs). These include injuries from syringes, sewing needles and other sharp objects.⁷

In many ways, incineration appears to be the ideal solution to waste management, 90% of those, installed during the last two decades are called controlled air incinerators. Infectious agents can remain in the ash or be released from the stack of medical waste incinerators.⁸⁻¹⁰ Dioxins and furans can be formed by burning polychlorinated biphenyls (PCBs). Dioxins are believed to be formed in incinerators, at a temperature of 500°C and destroyed at temperature of at least 900°C, but the incinerators must be running at maximum efficiency. Dioxin survival is favoured by low combustion temperature, wet refuse, insufficient or excess oxygen and inadequate residence time.¹¹ Steam sterilization has also proven to be a reliable way to treat infectious wastes. In fact, steam sterilization is considered as preferred treatment method for certain types of infectious waste.¹²

It was felt that due to the ever increasing size of patients in the secondary and tertiary care health institutions and diversification of services, it was a challenge, to manage health care waste in a systematic way. It was also observed that most of the large health care institutions were unaware, or unmindful, of paying attention to this important hazard due to medical waste.

The objective of this study was to find out current practices of disposal of Healthcare waste in the institutions which were surveyed.

METHODOLOGY

A cross-sectional analytic study was conducted in Lahore, Gujranwala and Sheikhpura, which are

some major districts of the province of Punjab. Punjab province is located on the southern side of Islamabad which is the capital of Pakistan. Lahore, the capital of Punjab is approximately 300 kilometers from Islamabad. One hundred and fifty health facilities including hospitals, dental surgeries, pathology laboratories and pharmaceuticals were considered the universe. Six hospitals were selected which included government and private hospitals and other nine health facilities were, dental surgeries, pathology laboratories and pharmaceuticals in the private health care sector.

Closed ended questionnaire was used to collect data from all the selected institutions. The questionnaire had eleven parts; consisting of forty three questions. The study instrument was pre-tested in non selected hospital. Personal visits were made in the respective districts and direct personal interviews method was applied for standardizing and accuracy of the collected information. Approximately three hours were spent in each health care facility to get the relevant information on the questionnaire.

The interviews were held with medical superintendents/ administrators of the HCFs, in the presence of paramedical and sanitation staff. In addition to the interviews, the factors relating to the handling of waste were observed directly. Data were entered in the computer using SPSS version 16 after necessary data cleaning. The analysis was to develop the descriptive, analytical and inferential outcome. Since it was mainly descriptive study, no test of significance was applied. Out of the fifteen, nine private and three public hospitals were taken. Eleven HCFs included Fatima Memorial Hospital Lahore, Ali Hospital Lahore, three laboratories, three Dental Surgeries and three Pharmaceutical industries. Out of the three laboratories, two were pathology labs meant for human tests, whereas, one was poultry diagnosis.

RESULTS

The non-indoor health care facilities were all from Lahore in view of their hospital load. The health institutions included were mainly of private ownership (11/15), with three from the government sector and one as trust hospital. In terms of the levels of the care, eight were providing miscellaneous services like laboratory, dental services and pharmaceuticals. The primary and tertiary care facilities were two each. There were three facilities of secondary level of care. (Table-I)

Among the six hospitals included, only one hospital had 150 beds, four were in the range of 300-350

Table-I: Categories, types and levels of HCFs.

| Categories of HCFs | Percent | Type of HCF | Percent | Level of Care | Percent |
|----------------------------|---------|----------------|---------|---------------|---------|
| Large (more than 100 beds) | 40.0 | Public | 20.0 | Tertiary | 13.33 |
| Medium (50-100 beds) | 0 | Private | 73.3 | Secondary | 20.0 |
| OPD | 60.0 | Others (Trust) | 6.7 | Primary | 13.33 |
| Total | 100.0 | Total | 100.0 | Others | 53.33 |
| | | | | Total | 100.0 |

beds and the remaining had more than 500 beds. Regarding the infectious control in the health facilities through the hospital waste management team/personals, only six HCFs had this system, whereas nine HCFs did not have any control. Five out of fifteen HCFs had no guideline/internal rules for the management of health care waste, whereas ten had some kind of rules. As regards plan including provision of training and guideline, 60% of the health care facilities had none and only 40% had gone through some training programs. (Table-II)

Six of the hospitals with indoor facilities were the only HCFs having management for weighing the waste generated. These hospitals were generating an average 0.292 kg/bed/day of the solid infectious waste. Fatima Memorial Hospital had highest weight per bed per day (0.322 kg) and private healthcare facility Ali Hospital had the lowest weight per bed per day (0.21 kg). By applying the average bed occupancy of these hospitals, it showed that an average 1372 kg of solid infectious waste was being generated per month in these hospitals. (Table-III)

As regards awareness and existence of any training programme regarding waste management, only 33% had positive answers. The remaining 67% were either unaware or lacked the management in this regard. Among the five hospitals having the knowledge and training programs, only two had topics covering waste in relation to infection hazards. Only one institution was covering the topic of managing an exposed or injured staff member by infectious waste. Similarly one institution was aware of the need to monitor the health surveillance and maintaining a record system of such incident due to the infectious waste. (Table-IV)

Table-II: Existence of Infectious Control Team, Availability of Guideline and Plan.

| Presence | Infectious Control Team (%) | Availability of Guideline for HCW (%) | Existence of Plan including training (%) |
|----------|-----------------------------|---------------------------------------|------------------------------------------|
| No | 60.0 | 33.3 | 60.0 |
| Yes | 40.0 | 66.7 | 40.0 |
| Total | 100.0 | 100.0 | 100.0 |

Seven of the institutions examined had no system for the segregation of waste, five were involved in segregating it by hazardous and general waste. Only three were performing segregation into general, soft infectious waste and hard infectious waste, none was performing the C-4, C-5 steps.

Key

C-1: No segregation.

C-2: Segregation of hazardous and general waste.

C-3: Segregation among general, soft infectious and hard infectious waste.

C-4: Segregation among general, soft infectious, hard infectious and anatomical waste.

C-5: Segregation among general, soft infectious, hard infectious, anatomical and radioactive waste.

Six of the health facilities had no separate bins for the collection of infectious waste. Thirteen (87%) HCFs had no labeling / colour coding containers for infectious waste. The containers for infectious and non-infectious waste for six wards and theatre of HCFs were not labeled. Pre-treatment of highly infectious lab waste was not done in any of the health facilities. Needle cutters or needle removers were not available in nine health care facilities whereas six hospitals and dental clinics had this facility. Four health care facilities had sharp containers for the collection of sharps whereas eleven use polythene bags for infectious waste. Eight health care facilities used only white bags for the collection of all type of waste whereas five used the two types of bags that were white and yellow. Only two health care facilities used three types of containers that were white and yellow bags for soft infectious waste and yellow sharp containers for hard infectious waste. Out of fifteen, twelve health care facilities did not use trolleys / wheel container for internal transportation of health care waste and ten health care facilities did not have protective clothing / material for waste management staff.

Out of fifteen, thirteen health care facilities did not have any temporary storage area and eleven did not have central storage area for waste. Two HCFs had temporary storage and four had central storage area. The two health care facilities which had temporary

Table-III: Waste Generation Rate.

| Sr. no | HCF | No of beds | Occupancy/day | Kg/bed | kg/day | kg/month (26-days) |
|---------|---------------------------------|------------|---------------|--------|--------|--------------------|
| 1 | DHQ-Kasur | 350 | 161 | 0.312 | 51.681 | 1343 |
| 2 | DHQ-Sheikupura | 300 | 200 | 0.305 | 61 | 1586 |
| 3 | DHQ-Gujrawala | 350 | 185 | 0.302 | 55.88 | 1452 |
| 4 | Shalamar hosp. Lahore | 350 | 151 | 0.301 | 45.45 | 1181 |
| 5 | Fatima Memorial Hospital Lahore | 510 | 281 | 0.322 | 90.32 | 2348.32 |
| 6 | Ali Hospital Lahore | 150 | 60 | 0.210 | 12.6 | 327.6 |
| Average | | | 156 | 0.292 | 52.82 | 1372 |

storage in wards did not have separate areas for hazardous and non-hazardous waste. The four health care facilities where central storage areas were present, only three had separate areas for hazardous and general waste. 53% of HCFs used carts, 33% used trolleys and 14% used two wheel bin containers. Sixty percent of the HCFs sent their waste bags through dedicated vehicles, 27% uses the municipality vehicles, whereas 13% used other means like pickups (small vehicles). (Table-V)

It was further observed that eighty percent had no onsite treatment facility. Only one (7%) HCF had incinerator facility to treat the HCW. The capacity of the incinerator installed in that health care facility was 1600 kg/day or 200 kg/hours. Open fire technique was being used by 13%. Majority (87%) of the health facilities had their final disposal of the health care waste (in the form of ash) by land filling at municipal dumping sites whereas, 13% threw the waste without burial. Most HCFs (80%) did not keep any record of their HCW disposal.

DISCUSSION

With the expansion of health care facilities and types of services, the increase in hospital waste had been recognized in the study. The inadequate waste management systems in these health care centres are posing a severe threat to public health as well as to the environment. This idea was also supported in the study done in Sylhet Bangladesh.^{5,13}

The traditional casual attitude towards an orga-

nized, systematic approach for hospital waste management was found prevalent in the study, 60% of the health care facilities had no training program, whereas 40% had gone through some training programs. Recent concern raised by various authorities against hazards to the hospital professionals and community at large has necessitated a serious insight toward hospital waste and its management. A study was done in the department of community medicine, Army Medical College Rawalpindi, Pakistan regarding the awareness of health hazards for sanitary workers. It was concluded that none of the sanitary workers ever received any training and they were unaware of the risks and hazards associated with handling of hospital wastes.¹⁴ The study carried out by Sultana Habibullah and Salahuddin Afsar from Karachi showed that at health-care facilities none of the sanitary workers had good knowledge in health-care waste disposal and 35 (71.4 %) health facilities disposed the waste in public dustbins.¹⁵

The present study could quantify the average waste load of various institutions by level and size of institutions. Government and private hospitals were generating an average 0.292 kg/bed/day of the solid infectious waste. Fatima Memorial Hospital had highest weight per bed per day (0.322 kg) and private healthcare facility Ali Hospital had the lowest weight per bed per day (0.21 kg). Suwannee in 2002 conducted a "Study on waste from hospital and clinics in Phitsanulok-Thailand". The average daily waste generated as general, medical and hazardous

Table-IV: Associated Risk of HCW

| Awareness/ Procedure/ Training/ Response | Associated Risk in staff Percent | Training Programme for HCW Percent | Training program associated with Infection Percent | Post exposure procedure Percent | Health Surveillance Percent | Reporting system on accidents Percent |
|---------------------------------------------------|-------------------------------------------|---------------------------------------------|----------------------------------------------------------------|------------------------------------------|-----------------------------------|------------------------------------------------|
| Yes | 33.3 | 33.3 | 13.3 | 6.7 | 6.7 | 6.7 |
| No | 13.3 | 20.0 | 53.3 | 33.3 | 33.3 | 53.3 |
| Don't know | 53.3 | 46.7 | 33.3 | 60.0 | 60.0 | 40.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

Table-V: Means of On-site and Off-site transportation.

| Means of Transportation | Frequency | Percent | Means of Transport | Frequency | Percent |
|-------------------------|-----------|---------|-----------------------|-----------|---------|
| Carts | 8 | 53 | Dedicated Vehicles | 9 | 60 |
| Trolleys | 5 | 33 | Animal carts | 0 | 0 |
| Two wheel Bin Container | 2 | 14 | Municipality vehicles | 4 | 27 |
| Total | 15 | 100 | Others | 2 | 13 |

waste from all hospitals in Phitsanulok province was found as 1.751,0.294 and 0.013 kg/bed respectively and at 0.323,0.041 and 0.002 kg/bed respectively from all clinics in Phitsanulok provinces. Medical waste from all hospitals consisted of needles, gloves, drain tubes, cotton and gauze, napkins, plastic syringes, swap and body parts with total daily generation at 0.452, 0.480, 0.390, 0.404, 0.018, 0.355, 0.004 and 0.382 kg/bed respectively.⁶

The study also provided a scientific situation analysis of the types of hazards due to hospital waste and gaps in its management. As regards awareness about viral hemorrhagic fever (VHF) among health care personals largest tertiary care hospitals in Karachi Pakistan, it was found that 90% doctors, 71% nurses, 32% laboratory technicians and 6% janitors knew about VHF.¹⁶

According to the World Health Organization, for safe management of the health care waste, four steps should be kept in mind, a) be aware of the public health risks from health-care waste, b) ensure that health-care waste are safely managed all along the waste stream, from the point of generation to its final disposal, c) choose disposal options carefully and d) think long term during the rehabilitation and reconstruction phase.¹⁷

This study concludes that a general inadequacy in the awareness and allocated staff for hospital waste management was observed in all the institutions studied. There were acute shortages in the facilities in collection, storage and transportation of the hospital waste. It was however observed that all institutions were keen to adopt a system which would be safe, sustainable and practical.

Authors Contribution:

Junaid Habib Ullah conceived, designed and did statistical data collection & analysis including manuscript writing. Khurshed Ahmad did review of manuscript. Amanullah Khan did review and final approval of manuscript.

Conflict of Interest:

No conflict of interest was involved with the authors and the institutions studied.

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