

ORIGINAL

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HOSPITALS; CARING AND CURING PALACES, OR THREATS OF INFECTIONS FOR THE COMMUNITY FROM INFECTIOUS WASTE.

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ABSTRACT... Ayaz@iimc.edu.pk **Objectives:** To know the amount of total waste generated in the hospital daily, to know the types of waste and the amount of infectious waste generated daily, and to know about knowledge and attitude of the health care workers, doctors nurses and sanitary staff about hospital waste. **Setting:** The study area is the Pakistan Railway Hospital a tertiary level care Hospital consisting of 380 beds and all the essential Departments. **Study Period:** the study was conducted from June 2006 to September 2006. **Material and methods: study design:** This was a cross sectional study Single tertiary level care hospital was studied due to limitation of time and resources. **Data collection:** Data was collected by using structured questionnaire and weighing of one day (24 hours) waste from all the units. Other relevant data was collected by structured interviews, meetings, discussions. **Results:** waste generated in twenty four hours is 229.75 Kg. The average waste generated per patient per day is 1.05 Kg, the quantity of infectious waste generated is 104.8 Kg i.e. 0.478 Kg per patient per day. Quantity of waste generated in order of maximum to minimum waste was Gynae/Obs 1.29Kg, Paediatrics 1.15Kg, Surgery 1.13 followed by Orthopaedics 0.80Kg, ENT 0.71 Medicine 0.48 and ophthalmology 0.4Kg all per bed per day. The responses show that all the categories of hospital workers are nearly not having the proper knowledge about the hazards and therefore unable to give suggestion or solution of the problem. **Conclusion:** Health care waste management in Railway Hospital is in bad shape. The general awareness on the subject is very much lacking both by the producers as well as handlers of waste.

There is acute need for training and sensitization of managers, staff and sanitary staff for safe disposal of waste.

Key words: Hospital waste management, landfills, Incineration.

INTRODUCTION

Medical waste is often described as any waste that is generated during the diagnosis, treatment, or immunization of human beings or animals or in research activities in these fields or in the production or testing of biologicals. It may include wastes like sharps, soiled waste, disposables, anatomical waste, cultures, discarded medicines, chemical wastes, etc. These are in the form of disposable syringes, swabs, bandages, body fluids, human excreta, etc. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner. It has been roughly estimated that of the 4 kg of waste generated in a hospital at least 1 kg would be infected¹. Hospital Waste Management: "Means the management of waste produced by hospitals using such techniques that will help to check the spread of diseases through it".

The World Health Organization (WHO) has classified medical waste into different categories. These are: Infectious: material-containing pathogens in sufficient concentrations or quantities that, if exposed, can cause diseases. This includes waste from surgery and autopsies on patients with infectious diseases, Sharps: disposable needles, syringes, saws, blades, broken glasses, nails or any other item that could cause a cut, Pathological: tissues, organs, body parts, human flesh, fetuses, blood and body fluids, Pharmaceuticals: drugs and chemicals that are returned from wards, spilled, outdated, contaminated, or are no longer required, Radioactive: solids, liquids and gaseous waste contaminated with radioactive substances used in diagnosis and treatment of diseases like toxic goiter and Others, waste from the offices, kitchens, rooms, including bed linen, utensils, papers etc. Hospitals and public health care units are supposed to safeguard the health of the community. However the waste produced by the medical care centers if disposed off improperly, can pose an even greater threat than the original diseases

themselves.

Pakistan is also facing such problems. There are no systematic approaches to medical waste disposal. Hospital wastes are simply mixed with the municipal waste in collecting bins at roadsides and disposed off, some waste is simply buried without any appropriate measure.

When waste containing plastics are burnt, Dioxin is produced, which can cause Cancer, birth defects, decreased psychomotor ability, hearing defects, cognitive defects and behavioral alterations in infants. Flies also sit on the uncovered piles of rotting garbage. This promotes mechanical transmissions of fatal diseases like Diarrhea, Dysentery, Typhoid, Hepatitis and Cholera. Under moist conditions, mosquitoes transmit many types of infections, like Malaria and Yellow fever. Similarly, dogs, cats and rats also transmit a variety of diseases, including Plague and Flea born fever, as they mostly live in and around the refuse. A high tendency of contracting intestinal, parasitic and skin diseases is found in workers engaged in collecting refuse.

Incinerators are fast becoming an obsolete technology in many developed countries as they are moving towards safer and more economical alternative approaches to medical and municipal waste management. As a result, many incinerator companies are targeting overseas markets where people are not yet aware of the serious health and environmental threats associated with incineration or the many advantages of alternatives.

Various alternative technologies to incineration are available at hospitals in many developed countries. Steam Autoclaving is the most widely used and most efficient alternative medical-waste-treatment technology. In chemical treatment systems, an anti-microbial

chemical, such as sodium hypochlorite, chlorine dioxide, or per acetic acid, decontaminate the medical waste. Most chemical treatment systems, currently in use, operate at ambient temperature.

In Microwave Radiation, medical waste enters the system by batch or continuous mode, where it is wetted with steam or water and heated by microwave radiation at de-contaminating temperatures.

The problematic areas are approximately the same for all healthcare units and at all stages of management including segregation, collection, packaging, storage, transport, treatment and disposal².

In Pakistan around 250,000 tones of medical waste is annually produced from all sorts of health care facilities. This type of waste has a bad affect on the environment by contaminating the land, air and water resources³. The Ministry of Environment (2004) and many other countries have already established strict guidelines for the management of infectious waste materials from medical institutions⁴.

In India also at present there is no specific system ensuring separation of infectious and non-infectious waste at source. These hospitals generate waste in substantial quantities, which needs to be managed by the hospitals themselves⁵. Health care facilities that practice pollution prevention benefit the environment by reducing the volume and toxicity of material at its source before it becomes a waste⁶. The practice of separation into different types of waste in health care institutes should be evaluated more scientifically⁷.

Waste should be removed from the hospital within 24 hours of its generation to prevent environmental contamination caused by any accidental spillage of waste. General waste generated in the hospital should be treated similar to infectious waste, as it can be equally hazardous. In a study in Mauritius, showed that waste generation rates would differ between public hospitals and private clinics. An average of 0.179 Kg/bed day of hazardous waste were generated at the private clinic

which was higher than the value of 0.072 Kg/bed day generated at Public hospital⁸.

The awareness and training on waste management issues even among the in-house medical staff of major government hospitals does not exist⁹. While the volumes of hazardous wastes generated are small in comparison to an industrial facility¹⁰. Based on the assessments of three hospitals under the California study, the highest volume of hazardous waste generation comes from the use of chemotherapy and anti neoplastic chemicals, followed by spent photographic chemicals and formaldehyde solutions used for disinfecting equipment¹¹. Guidelines for Hospital Waste Management In Pakistan were prepared since 1998 by the Ministry of Health, Government of Pakistan, A project was implemented in January, 2000 in the biggest hospital in every province by the Ministry of Health in Islamabad, in collaboration with WHO¹². Since costs for safe treatment and disposal of hazardous health-care waste are typically more than 10 times higher than those for general waste¹³. Waste minimization will also give rise to financial savings¹⁴. It is therefore emphasized that even very limited waste management measures can dramatically reduce this risk. All these measures to reduce risk are relatively simple and cheap and should be considered by any health-care establishment.. The study in CMH Rawalpindi concluded that sanitary workers of CMH, Rawalpindi are unaware of the risks and hazards associated with handling of hospital wastes. There is a need to improve the training and education of all hospital housekeeping staff in the principles of management of hospital waste¹⁶. General waste generated in the hospital should be treated similar to infectious waste, as it can be equally hazardous¹⁷.

METHODS AND MATERIALS

This was a cross sectional study conducted from June 2006 to September 2006 at the Pakistan Railway Hospital a tertiary level care Hospital consisting of 380 beds and all the essential Departments.

The objectives of the study were

1. To know the amount of total waste generated in the hospital daily.

2. To know the Types of waste and the amount of infectious waste generated daily,
3. To know about knowledge and attitude of the health care workers, doctors nurses and sanitary staff about hospital waste.

Data was collected by using structured questionnaire and weighing of the waste from all the units according to the schedule of disposal by the sanitary workers. It also involved the collection, sorting (segregation), identification, and characterization and weighing of waste from wards and units in the Railway hospital, other relevant data was collected by structured interviews, meetings, discussions.

The quantity of infectious and non infectious waste was recorded separately. The amount of infectious and non-infectious waste generated in Kg/ day was calculated in each ward. The percentage of infectious to non infectious waste was determined by calculation.

Data was analyzed in the form of frequencies, tabulation, cross tabulation, percentages and was displayed in tables and graphs using calculator, Microsoft Excel and SPSS 10.05 (Statistical package for social sciences).

Written formal consent was taken from the Medical Superintendent of the hospital, data collectors were trained and all the concerned staff like Doctors and nursing staff of all the wards and departments were also informed about the exercise. Total waste from every department was weighed by the standardized weighing scale after observing all the precautionary and safety measures as required by all the staff. The staff included was sanitary workers of the hospital, in-charge staff nurses, doctors and the principal investigator.

RESULTS

Pakistan Railway hospital is a tertiary level care Hospital attached with the Islamic International Medical College. It is situated in Rawalpindi and consists of all the major specialties e.g.; Medicine, surgery Paediatrics, ENT,

Eye, Gynaecology, Orthopaedics, Dermatology and Psychiatry. Various other disciplines like OPD, Operation Theatre ICU, Pathology Laboratories, and emergency all sorts of necessary facilities are available which a teaching hospital should have. It consists of 380 beds as mentioned below. Table-I

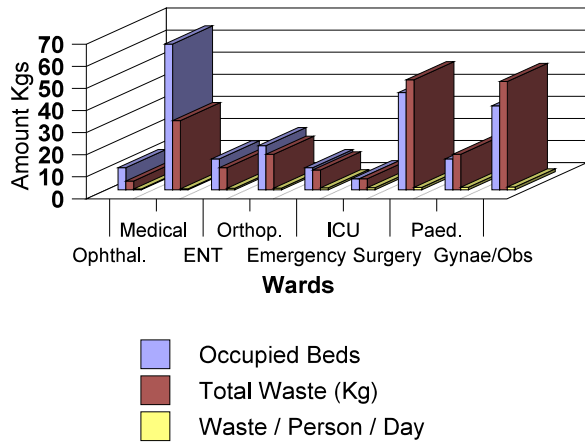
Department	Beds Available
Medicine	97
Surgery	95
Pediatrics	40
ENT	26
Eye	35
Gynecology	46
Orthopedics	31
Dermatology	5
Psychiatry	5
Total	380

The waste was collected in three shifts as morning, evening and night shift. The total sum was calculated by collecting the three shifts. There are three hundred and eighty beds out of which 219 i.e. 73 % were occupied. The total waste generated in twenty four hours is 229.75 Kg, it means that the average waste generated per patient per day is 1.05 Kg. the quantity of infectious waste generated is 104.8 Kg i.e. .478 Kg per patient per day. The over all quantity of waste in terms of infectious and non infectious is that 46% of the total waste generated is infectious waste. Quantity of waste generated in order of maximum to minimum waste was Gynae/Obs 1.29Kg, Paediatrics 1.15Kg, Surgery 1.13 followed by Orthopaedics 0.80Kg, ENT 0.71 Medicine 0.48 and ophthalmology 0.4Kg all per bed per day. Table II

Table-II. The amount of waste collected					
Ward	No. of Beds	Occupied Beds	Total Waste (Kg)	Infectious Waste (Kg)	Non-Infectious Waste (Kg)
Kitchen	*	*	3	0	3
Operation Theatre	*	*	3.5	3.5	0
Ophthalmology	35	10	4	0	0
ICU	5	5	5	5	0
OPD	*	*	7	1.5	5.5
Emergency	10	10	9	8	1
ENT	26	14	10	4.5	5.5
Paediatrics	40	14	16.1	6.3	9.8
Orthopaedics	31	20	16.1	4.75	11.35
Pathology Labs	*	*	25.85	20	5.85
Medical	97	66	31.35	7.85	24.30
Gynae/Obs	46	38	49.05	29.25	19.80
Surgery	95	44	49.80	14.95	34.85
Total	380	219	229.75	104.8	124.45
* Not applicable					

Table-III. The amount of infectious and non infectious waste in different wards						
Ward	No. of Beds	Occupied Beds	Total Waste (Kg)	Infectious Waste (Kg)	Non-Infectious Waste (Kg)	Waste / person / day
Ophthalmology	35	10	4	0	0	0.4
Medical	97	66	31.35	7.85	24.30	0.48
ENT	26	14	10	4.5	5.5	0.71
Orthopaedics	31	20	16.1	4.75	11.35	0.80
Emergency	10	10	9	8	1	0.9
ICU	5	5	5	5	0	1
Surgery	95	44	49.80	14.95	34.85	1.13
Paediatrics	40	14	16.1	6.3	9.8	1.15
Gynae/Obs	46	38	49.05	29.25	19.80	1.29

Fig-1. Waste generation in different wards



Regarding the knowledge and attitude of the health workers the categories involved were the Doctors, Nurses and Sweepers. These are the main that are at risk of the hazards of infectious waste.

The responses by the doctors, Nurses and Sweepers give the interesting features which can be seen in the below mentioned table.

The responses show that all the categories are nearly not having the proper knowledge about the hazards and therefore are unable to give suggestion or solution of the problem.

Table-IV. Hazard Identification

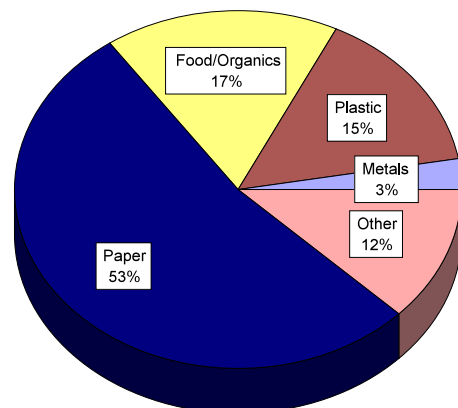
	Hazard Identification		Suggestion		
	Know the Hazard %	Do Not Know %	Simple Burning %	Incinerate %	Do no Know %
Doctors	40	60	20	40	40
Nurses	40	60	12	32	56
Sweepers	20	80	0	0	100

Regarding the waste collection equipment 40% respondents told that it is available, 30% said not available and 30% do not know. 30 % respondents disclosed that Hospital guidelines are available while the opinion of 70 % was against.

Regarding the training about safe disposal of waste 40 % were trained while 60 % were ignorant about the training. Another important feature showing the intensity of problem was Accidental exposure and 40% among the interviewed had got some sort of accidental exposure.

Regarding the composition of waste it was found as shown in the following Diagram. Fig-2

Fig-2. Composition of waste



DISCUSSION

In the present study it was observed that the average amount of waste generated per person per day is 1.05 Kg, which is according to the previously conducted international studies as well as mentioned by the WHO (world Health Organization) which mention the amount in between .5-2 Kg. The amount of waste generated per day is not sufficient enough to be incinerated independently as incineration is a costly process but can be run by sharing with other similar hospitals. Enactment of legislation will not make it more efficient. Health care waste should be subjected to disinfection and mutilation prior to reuse, recycling or disposal¹⁸.

The study concluded that inappropriate and unhygienic system of primary storage and collection exists. The infectious waste and sharps are not handled separately. The sanitation staff is uneducated and not trained to handle the health care waste. No protective gears and clothing are provided to them, even simple hand gloves are not used. The sanitation staff manually handles the health care waste including the infectious waste and sharps. The tools and equipment utilized by the sanitation staff includes brooms, brushes and trolleys inside the premises while one wheel trolley and buckets are used for conveying waste from inside to outside of the health care facilities. The tools and equipment were found to be insufficient, inadequate and unhygienic.

In the study it was special to mention that only 40% of doctors and Nurses were aware of the adverse effects of the hospital waste and 60% of the Doctors and Nurses were unaware. It is surprising that the people who are at risk, or the people who have to educate the rest of community about the deleterious effects of the infectious waste, they by themselves are unaware of the problem.

It was quite evident that if the segregation at source is not done then all the efforts to be done afterwards are useless. Once the infectious waste get mixed with the non-infectious all the waste is now converted into the infectious waste. This waste is transported by the municipal administration in the trucks collecting waste from the other parts of the city. There is no demarcation

of the hospital waste and the house hold waste. All the waste is transported in the open way traveling from within the city and dumped on open places without observing the proper sanitary disposal for the waste¹⁹.

There is need for further research and epidemiological surveys. Very few data are available on the health impacts of exposure to healthcare waste, particularly in the case of developing countries. Better assessment of both risks and effects of exposure would permit improvements in the management of health-care waste and in the planning of adequate protective measures²⁰.

CONCLUSION

Health care waste management in Railway Hospital is not up to the mark. The general awareness on the subject is very much lacking on part of managers, producers, and handlers of waste. The health care waste is usually being mixed with the domestic waste which is collected, transported and disposed in similar manner as the general solid waste.

No Health Care Waste Management plan, methodology, rules and regulations exist within the hospital. No previous and on going programme on waste minimization was witnessed. The awareness and training on waste management issues among the medical or sanitary staff was at its lowest level.

RECOMMENDATIONS

Based on the study and literature review of previous relevant studies the fact based & broad based recommendations for the improvement of existing health care waste management system are made as under.

1. Organizing awareness and training programme for the staff of health care facilities. The training should be at three tier level including the medical practitioner/doctor/paramedical staff, sanitation staff and users of medical facilities.
2. A comprehensive and detailed study needs to be undertaken to assess the quantities of solid waste generated at the health care facilities. The

- components, composition and quantities needs to be assessed and confirmed which will form the basis of planning, designing and implementation of waste management facilities.
3. The sanitation staff needs to be provided with appropriate gloves, protection gears and clothing.
 4. Appropriate solid waste storage containers are to be provided at all generating stations/points in the health care facilities.
 5. The storage facilities needs to be hygienic and covered to discourage the entry of rodents, insects and other vermin.
 6. Burning of health care waste is to be avoided and discouraged.
 7. The infectious health care waste is to be completely segregated from the domestic and commercial waste. Use of colour coded bags can be adopted for clinical waste at the hospitals and health care establishments.
 8. The transportation of health care waste to disposal and treatment sites needs to be done as per hygienic standards.
 9. In the absence of proper incineration facilities for destruction of infectious health care waste, other cheap and robust solutions should be adopted including sanitary land filling and utilizing proper trenching and covering material.
 10. A centralized health care waste collection facility needs to be operated on scientific lines. The vans should collect the waste and transfer to the incineration facilities. The ashes produced by incineration needs to be sanitarily disposed at the landfill site.
 11. Mass awareness campaign needs to be planned, designed and implemented to make the people aware of the consequences of infectious waste.
 12. The recyclable portion of health care waste material needs to be separately stored, utilized, recycled and reused.
 13. Syringes and used blood bags are elements which need to be properly disposed /recycled. The metal plastic parts need to be separated by appropriate means.

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