

Hospital Waste Disposal: A Review Article

Nosheen Arshad*, Shamail Nayyar *, Dr. Fatima Amin* and Dr. Khawaja Tahir Mahmood**

*Department of Pharmacy, Lahore College for Women University, Lahore, Pakistan

**DTL, Lahore, Pakistan

Abstract

This is a review paper which is prepared from the surveys of hospitals and research studies. Hospital waste management in the world is a formal discipline and does occupy a critical place in the management of health care sector. The management of hospital waste requires its removal and disposal from the health care establishments as hygienically and economically as possible by methods that all stages minimizes the risk to public health and to environment. To analyze the present situation analysis of medical waste management systems was performed to understand the various handling and disposal procedures, the knowledge and awareness of individuals involved in medical waste generation, handling and disposal, and the potential impacts of the waste stream on both human health and the natural environment. The method adapted for present study was literature review and survey method. The data collection was done through questionnaire (data collection form), informal interviews and site visits. It was found that a variety of methods were used by the medical facilities to dispose their wastes including burning burial, entombing, selling, dumping, and removal by municipal bins. The waste disposal practice was found to be quite unsafe, and both clinical and non-clinical wastes were found to be thrown together. There was insufficient awareness of the magnitude of the medical wastes issue by concerned individuals at different levels from director or divisional head to waste pickers. There was no safety measure observed in dealing with waste disposal or laboratory analysis of infectious diseases. Medical waste incineration is identified as the most preferred disposal method. It is important to point out that there is a great potential to emit air toxic pollutants from such incinerators if improperly operated and managed. However there are some institutions which practice the most sound hospital waste management practices such as Shaukat Khanum and Shalamar. From this study it can be said that proper waste management strategy is needed to ensure health and environmental safety.

Key words: Hospital Waste, Hospital waste management(HWM), Hospital Waste disposal

INTRODUCTION

Hospital waste management is an important process that must be dealt with diligently. The management of hazardous waste material requires specific knowledge and regulations and it must be carried out by specialists in the field.

Heaps of litter is taken to dumpsites in developed countries. However, in developing countries, waste mostly ends up on road sides and empty plots. Untreated waste bears an economic cost for residents of the area and is also an environmental hazard. Increasing pollution leading to environmental changes and economic cost related to waste in terms of health hazards and negative impact on infrastructure have changed the way authorities view it.

Though waste management is a relatively new phenomenon, it has caught the attention of governments all over the globe. Today the term waste management covers collecting, sorting, processing, recycling and reusing materials that would otherwise be considered as useless. This article is concerned with comparing

practices for the management of healthcare waste using five case study hospitals. Compliance with the Waste Management Rules 2005, under the Environment Protection Act (1997), of the Government of Pakistan was used as the standard.

Until fairly recently, medical waste management was not generally considered an issue. In the 1980s and 1990s, concerns about exposure to human immunodeficiency virus (HIV) and hepatitis B virus (HBV) led to questions about potential risks inherent in medical waste. Thus hospital waste generation has become a prime concern due to its multidimensional ramifications as a risk factor to the health of patients, hospital staff and extending beyond the boundaries of the medical establishment to the general population. [1]

Hospital waste refers to all waste, biologic or non- biologic that is discarded and not intended for further use. Medical waste is a subset of hospital waste; it refers to the material generated as a result of diagnosis, treatment or immunization of patients and

associated biomedical research. [2] Biomedical waste (BMW) is generated in hospitals, research institutions, health care teaching institutes, clinics, laboratories, blood banks, animal houses and veterinary institutes. [3]

Hospital waste management means the management of waste produced by hospitals using techniques that will check the spread of diseases.[4]In developing countries, awareness regarding hospital waste management in terms of its segregation, collection, storage, transportation and disposal is lacking.[5,6] Studies in Pakistan show that around 2.0 kg of waste/bed/day is produced out of which 0.1- 0.5 can be categorized as risk waste.[7]

The management of hospital waste poses a major problem in most of the countries. In recent years, medical waste disposal has posed even more difficulties with the appearance of disposable needles, syringes, and other similar items. There are several categories of hospital wastes according to their weight density and constituents. The World Health Organization has classified medical waste into different categories, which are, infectious, sharps, pathological, pharmaceutical and radioactive.

There are several categories of infectious waste like human tissues and body parts, animal carcasses, syringes, blades, saws, drugs, vomits, urine, chemicals and fluid from laboratories. Infectious health-care waste is a major cause of HIV/AIDS, hepatitis B and C viral infections. These viruses are generally transmitted through injuries from needles and sharp objects, which are contaminated with human blood. There are however, numerous other diseases which could be transmitted by contact with health-care wastes. These are urinary tract infections, respiratory tract infections, wound infections, bacteremia, and skin infections etc.[WHO 2004,8]

Healthcare waste disposal in each country depends upon a number of factors including sensitization level of the health managers as well as other professionals, existing local legislations and available resources. In Pakistan, despite the

existence of Pakistan Biosafety Rules 2005, neither proper hospital waste management systems have been developed in various health institutions nor the concerned health professionals and managers are aware of the gravity of the situation resulting therein. The total quantity of waste generated by the health facilities is usually disposed with the municipal waste or burned openly raising environmental concerns. The storage of waste before disposal is usually open and the element of waste segregation followed by appropriate disposal methods for various sections of the waste is almost non-existing.[9]

Studies in Pakistan showed that around 2.0 Kg of waste/bed/day is produced out of which 0.1-0.5 can be categorized as risk waste. Daily about 4 to 2,000 Kg of waste is generated by various health outlets; of which 75% to 90% is non-risk produced by the health care premises, housekeeping, and administrative functions while only 10-25% is infectious and needs more careful disposal. Moreover, failure to dispose off used syringes, blades etc. leads to their reuse enhancing the risk of disease transmission.[9]

In Pakistan usually two methods are being used to dispose- off the hospital waste i.e. landfills and incineration. In landfill method, hospital waste is buried underground but according to health experts not a single landfill is constructed on scientific lines. Incinerators installed at various places also do not have proper filters and scrubbers and when hospital waste is burnt, toxic gases like dioxin and chemicals are discharged in the air which can be potential carcinogen. Only a few hospitals have proper incinerators. Health experts recommend that the hospital waste should be segregated from the solid waste and stored in special containers. Proper landfills should be constructed and all incinerators working without filters and scrubbers should be immediately shut down.

MATERIALS AND METHODS

A cross-sectional study was conducted in five hospitals (2 private and 3

governments) Children hospital, Sheikh Zayed hospital, Shaukat Khanum hospital, Mian Munshi hospital, Shalamar hospital of Lahore in July 2010. This study is based on the review of available information on medical waste, as relates to their nature, impacts and management techniques. Keeping in view the infrastructural requirement for Hospital Waste Management and adherence to Pakistans HWM Rules 2005. Methods of storage and segregation at ward / department level, internal transportation, external transportation and on site final disposal / off- site disposal were studied for all 5 hospitals. Information was obtained through literature review and online search. After extensive literature search, a questionnaire was developed to collect information regarding disposal of biomedical waste generated in the hospitals. The hospitals were visited and the administration of the institutions were interviewed to get in-depth knowledge regarding waste management policy and training of staff. The study was explained to them and verbal consent was obtained. The statistical technique used for the analysis of collected data was estimation of simple percentage.

OBSERVATIONS AND RESULTS

A cross-sectional study was conducted in five teaching hospitals of Lahore through convenience sampling. Hospitals of both government and private sector were included. The hospitals were visited and the presence or absence of waste management technique was noted. The administrators of the institutions were interviewed to get in-depth knowledge regarding waste management policy and training of staff. Data collected from questionnaire was analyzed using percentages.

Different types of waste produced in hospitals including radioactive in visited hospitals as shown in figure 1. This showed that proper waste disposal is required in all hospitals.

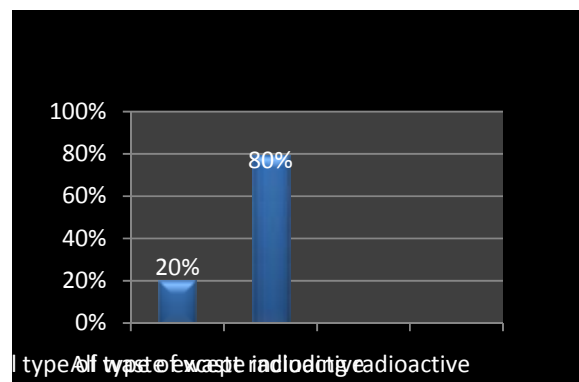


Figure 1. Type of waste material in hospital

Segregation of waste is an important step in waste management plan. Segregation is separation of risk waste from non-risk waste at source, that is at the ward bedside, operation theatre, laboratory, or any other room in the hospital where the waste is generated, by the doctor, nurse, or other person generating the waste. Segregation is done in all hospitals as shown in figure 2.

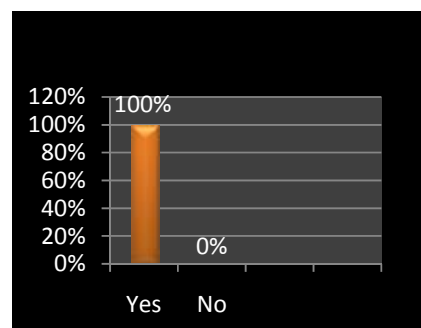


Figure 2. Is there segregation of waste?

Overuse of injections is common in general medical practice in the developing countries, including Pakistan. All disposal medical equipment and supplies including syringes, needles, plastic bottles, drips and infusion bags shall be cut or broken and rendered non-reusable at the point of use by the person in-charge. Needle cutter used in 60% of hospitals.

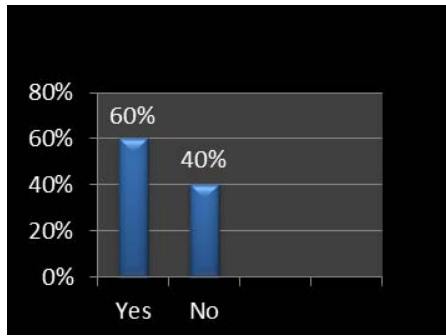


Figure 3. Needle cutter for used syringes

Hospital waste generation plan shows the disposal points of waste of every ward and department, details and numbers of every container and trolleys used for the disposal, time tables showing frequency of waste collection, duties and responsibilities for each of the different categories of hospital staff member. Figure 5 shows that 60% of hospitals have waste generation plan.

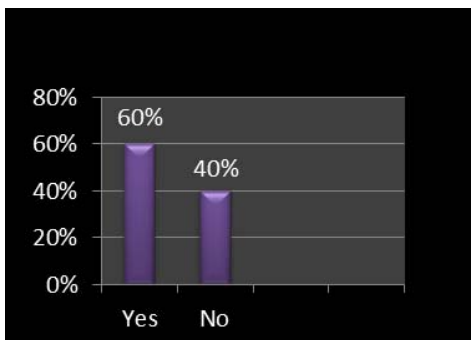


Figure 4. Hospital has waste generation plan

Waste management team is responsible for better administration, preparation, careful planning, monitoring, periodic review and control disposal operations figure 5 shows that 60% of hospital have waste management team.

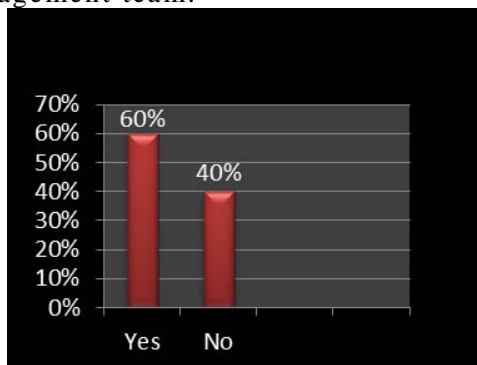


Figure 5.Existence of hospital waste management team.

Vaccination of hospital employees is essential. It protects the employees against many infectious diseases like HBV and employees of all hospitals visited were vaccinated as shown in figure 6.

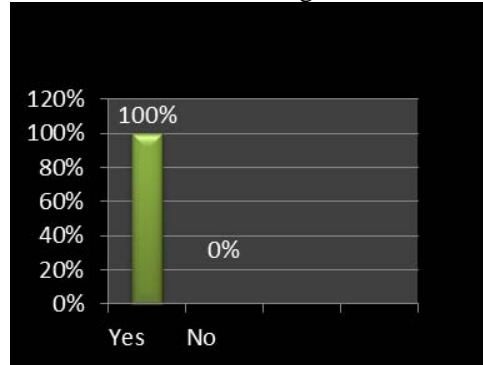


Figure 6. Employees involved in handling of waste are vaccinated

Segregation of waste in different colored bags like yellow, red and black colored containers was practiced in 80% of hospitals as shown in figure

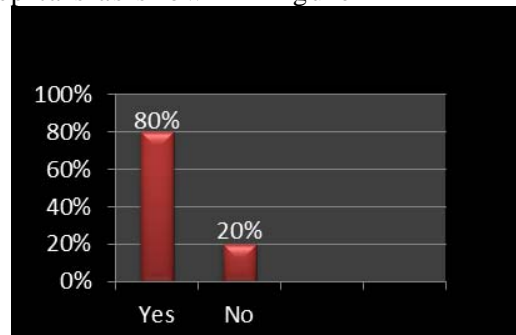


Figure 7. Different colors bags used for waste disposal

For on-site transportation different type of transportation means were present among them carts were commonly used as shown in figure 8.

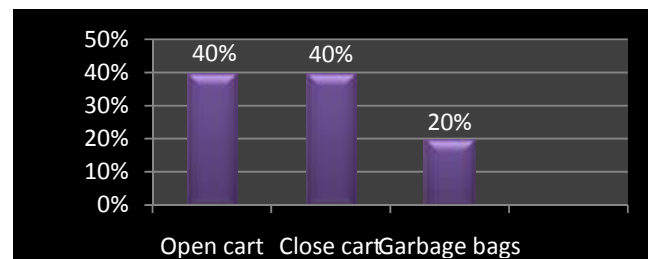


Figure 8. Internal collection of waste by.

Transportation to final treatment site was done by hospital employees in 80% of hospitals.

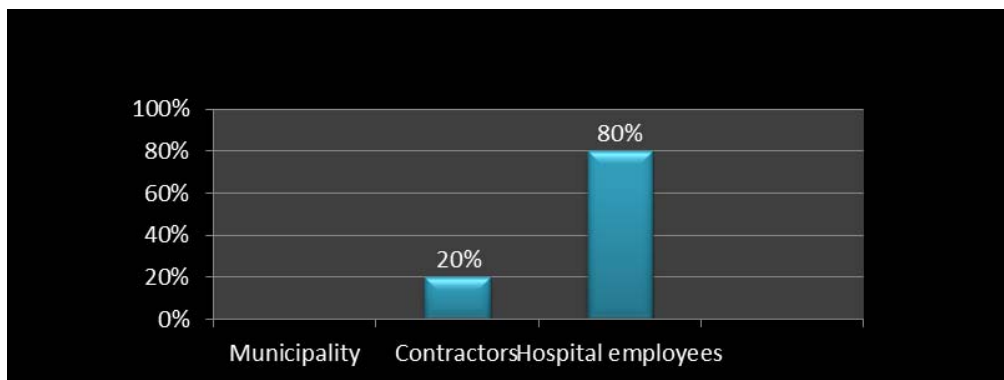


Figure 9. Transportation of waste to final treatment by

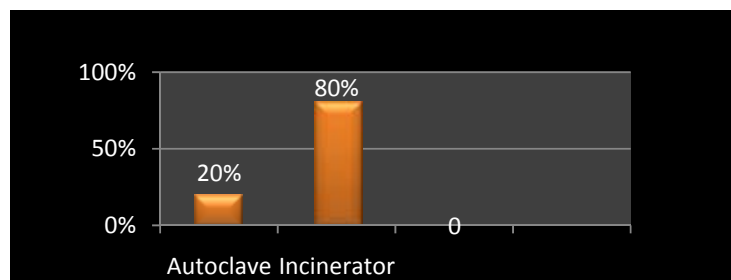


Figure 10. Final treatment of waste is done by

Depending upon the type and nature of the waste material and the organisms in the waste, risk waste should be inactivated or rendered safe before final disposal by a suitable thermal, chemical, irradiation incineration, filtration or other treatment method, or by a combination of such methods, involving proper validation and

monitoring procedures. Figure 10 shows that incineration was considered the final treatment method in 80% of hospitals. Hospital employees, private company and other co-operative hospitals could be involved in waste management as shown in figure 11.

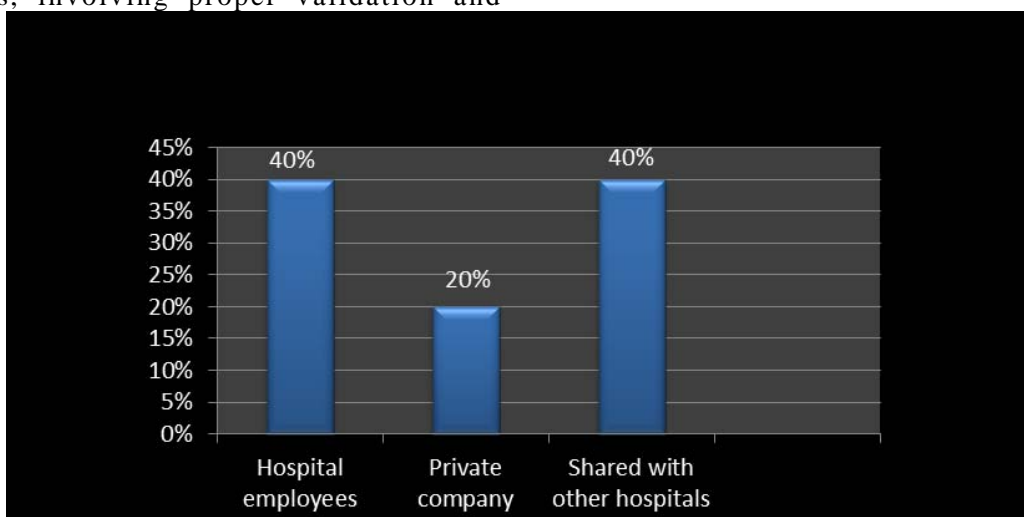


Figure 11. Who is responsible for hospital waste management?

Radioactive waste which has decayed to background level shall either be buried in the landfill site or incinerated:

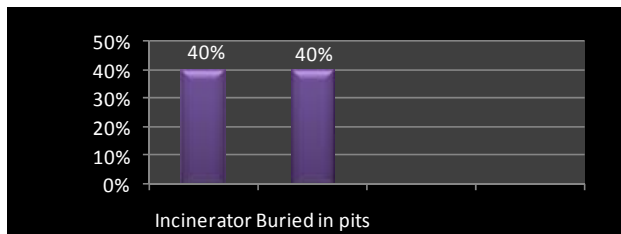


Figure 12. Final disposition of nuclear waste in

Infectious liquid waste from laboratories, different departments is produced in all hospitals but 40% hospitals have liquid waste management plan.

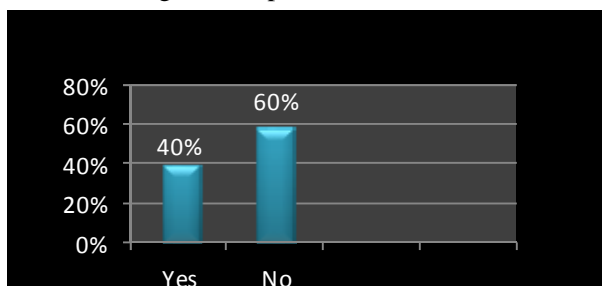


Figure 13. Is there any liquid waste management plan?

Record keeping of waste generated is very important as it provides information about categories and quantities of waste handled every day. Record of waste generated kept in 60% of hospitals as shown in figure 14.

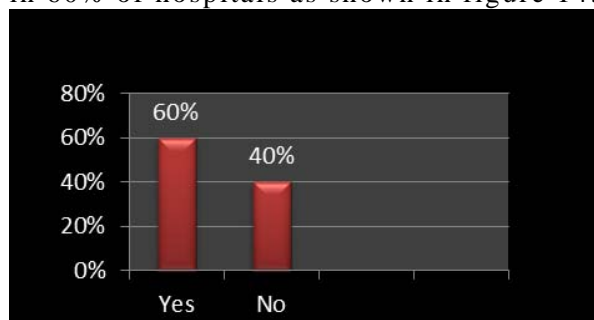


Figure 14. Record of waste generated kept Pharmacist is member of waste management team in 80% of hospitals a shown in figure 15.

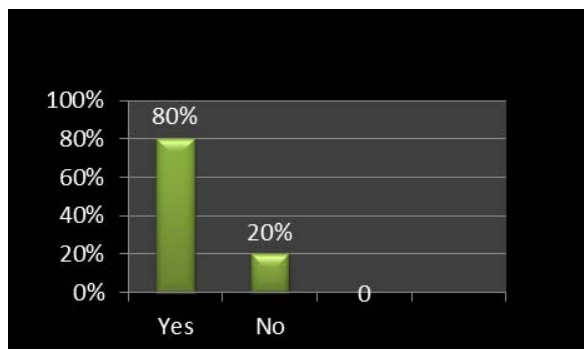


Figure 15. Is there any role of pharmacist in hospital waste management?

DISCUSSION

The generator of waste is responsible for ensuring proper disposal. Hospitals are socially obliged to maintain a clean environment and dispose medical waste in order to prevent pollution and infection within and near the hospital. The hospital waste management plan outlines the interpretation of the legislation or a standard protocol to achieve essential elements for establishment of a proper hospital waste management system.[10] In the current study it was found that only two hospitals had well documented waste management plans as well as proper waste management team. There are ‘Guidelines for Hospital Waste Management In Pakistan’ prepared by the Environmental Health Unit, of the Ministry of Health, Government of Pakistan, since 1998. This gives detailed information covering all aspects of safe hospital waste management in the country, including the risk associated with the waste, formation of a waste management team in hospitals, their responsibilities, plan, collection, segregation, transportation, storage, disposal methods, containers and their color coding, waste minimization techniques, protective clothing, etc. Further that heavy penalties shall be imposed on the institutions found to be negligent.

Bad practices on reused needles was mentioned by journalists and by S. Batterman in his report on small medical waste incinerators prepared for WHO: "In some countries (e.g., Pakistan), contaminated disposable needles are often scavenged, repackaged, sold and reused

without sterilization. Such practices are associated with serious health implications due to the transmission of infectious disease, especially hepatitis and AIDS.” Medical waste in Pakistan is land-filled and burned in small scale incinerators located inside hospitals. These incinerators generally do not have any APC devices with some exceptions, for example the simple APC (air pollution control) system in the waste incinerator in Shaukat Khanum Hospital, Lahore. There are no dioxin emissions measurements as there is no laboratory capable of doing such measurements in Pakistan. Waste incineration residues are mostly buried in deep pits inside hospitals areas and/or land-filled in dumpsites used for municipal waste in general. These dumpsites have no lining/insulation in most of the hospitals. There is lack of awareness of the management regarding detailed laws and regulations governing health care waste management. This encourages reuse and unhygienic recycling of waste material.

Pakistan is in a phase of creating awareness and implementing hospital waste management techniques. The concerted efforts needed might fall short, if the attitudes of the staff and the public towards this, is not changed. [11]According to USAID with respect to drinking water supply and wastewater management at selected health facilities, both of them are also in a critical situation. Inappropriate hospital wastewater management is a source of environmental pollution and health risks. Hospital wastewater is loaded with pathogenic microorganisms, heavy metals, disinfectants, detergents, solvents, pharmaceuticals, among others. Uncontrolled discharge in most of hospitals enhances the eco-toxicological risk for environment and toxic or infectious risk for humans. With reference to hospital waste management, institutional strengthening to develop, implement and enforce regulations on hospital waste management is needed.

Sensitization, motivation campaigns and technical courses among professionals, technicians and sanitary workers should be

carried out; so that they identify themselves with their responsibilities. Suggested strategy to develop training courses should be “Training of trainees”. Course content and planning procedures are included. In relation to wastewater management, an adequate wastewater treatment system is required at all facilities. Discharging of hospital wastewater to municipal sewers without pretreatment is not recommended. Minimal requirements for small facilities would be installation of proper septic tanks and soak-away systems.

It is fundamental to ensure a good design, construction, functioning, and monitoring of septic tank and soak-away system, otherwise odor nuisance, flooding and pollution problems could be generated. A proper and on-time maintenance to the system, including a periodic monitoring are also obligatory activities. At the end it is recommended to implement the suggested measures on hospital waste management, drinking water supply and wastewater management in selected facilities; which are going to improve human health and environment.

CONCLUSION

Proper collection and segregation of biomedical waste are important. There is not enough information on medical waste management technologies and its impact on public health and environment. Practice of proper medical waste disposal and management is also inadequate. However, there is need for raising awareness about medical waste and its related issues. Comprehensive analysis of current waste management practices in both government and private hospitals. Arrangement of proper training programs of hospital staff and health professionals. Monitoring and evaluation of hospital waste management interventions. The need for health care waste management planning to facilitate the implementation of necessary measures to improve the present health care waste management situation.

The role for pharmacists in this area is significant. As one pharmacist stated, "if we sell it, we are responsible for collecting

and disposing it as well". Elements of the role for pharmacists include. Establishing a disposal process, possibly in conjunction with associations, manufacturers and hospital administration. Establishing a program for the return and disposal of unused drugs which includes: Encouraging patients to return their drugs to the pharmacy, Collecting expired, discontinued and unused drugs from patients, Tabulation and documentation of volume of waste and rationale/causes/sources for waste and Using this information to support the need for waste reduction programs and attract or maintain sponsorship.

ACKNOWLEDGEMENT

The authors would like to thank all the people who supported, in carrying out the whole study especially Vice Chancellor, Lahore College for women university and Project supervisor Dr. Khawaja Tahir Mahmood.

REFERENCES

1. Gordon JG, Reinhardt PA, Denys GA (2004): *Medical waste management. In: Mayhall CG* (EDs.), *Hospital epidemiology and infection control, (3rd)*. Lippincott Williams and Wilkins publication, pp : 1773-85.
2. Rutala WA, Weber DJ (2005). *Disinfection, sterilization and control of hospital waste. In: Mandell, Douglas and Bennett's Principles and practice of infectious diseases (6 th ed.)*, Elsevier Churchill Livingstone Publication, pp: 3331-47.
3. Sharma M (2002): *Hospital waste management and its monitoring, (1 st ed.)*, Jaypee Brothers Medical Publication
4. Mahmood M, Shahab S, Malik R, Azim W. A study of waste generation, collection and disposal in a tertiary hospital. *Pak J Med Res*, 2001;40:13-17.
5. Ather S. Hospital waste management. *J Coll Physicians Surg Pak* 2004;14:645-6.
6. Uysal F, Tinmaz E. Medical waste management in Trachea region of Turke., *Waste Manag Res* 2004;22:403-7.
7. Hashmi SK, Shahab S. *Hospital and biomedical waste management. In: Iliyas M, Editor, Community medicine and public health. 4th ed. Karachi: Time Publishers, 2003, pp. 426-37.*
8. Ahmed Rehan: Hospital Waste Management in Pakistan: Case Study Report Special Waste Fractions: Hospital Waste August 1997
9. Fazli Hakim Khattak: Hospital Waste Management in Pakistan, *Planning Commission, Government of Pakistan, Islamabad*
10. Shahida Rasheed, Saira Iqbal, Lubna A. Baig, *Kehkashan Mufti: Hospital Waste Management in the Teaching Hospitals of Karachi*
11. Basu RN, Issues involved in hospital waste management: an experience from a large teaching institution. *J Acad Hosp Adm* 1996;8:79-83