Bio-medical waste management practices: A case study

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Abstract

The safe and sustainable management of biomedical waste is social and legal responsibility of stakeholders involved in health care activities. Effective Biomedical waste management (BWM) is mandatory for a cleaner environment. The present research aims to study the process of managing the medical waste, which includes segregation, storage, and disposal of medical wastes in public and private hospitals in the Shimoga city of Karnataka. A structured questionnaire was circulated among 100 health workers at hospitals in Shimoga with 100 respondents from governmental hospital and 100 respondents from a private hospital respectively. Simple random sampling procedure adopted for sampling selection. The results of the study reveal that the, health care facilities in private and governmental hospitals struggle to initiate appropriate biomedical waste management. Among the hospitals chosen for the study, healthcare waste management is unprofessional to say the least. The personnel handling biomedical waste are not trained. Hospitals doesn't seem to provide emphasis on employing professionally trained staff to manage biomedical waste. Healthcare department which comes under Shimoga corporation, should seriously give a thought towards bringing about policies for bio-medical waste disposal. A model biomedical waste management should be in place specific to Shimoga city.

Keywords: Bio-medical waste, hospital waste, waste disposal, waste management, Shimoga city.

Introduction

Managing biomedical waste has become a major point of concern these days due to the adverse impact it has on the environment. The recent developments in health care units are precisely made for the prevention and protection of community health. Sophisticated instruments have come into existence in hospitals, laboratories, healthcare research institutions, treatment and other related services. The use of more sophisticated medical equipments in healthcare sector have resulted in the generation of higher units of per capita biomedical waste. Waste generated in the process of health care includes, hypodermic needles, scalpels, blades, surgical cottons, gloves, bandages, clothes, discarded medicine and body fluids, human tissues and organs, chemicals etc., Other

wastes generated in healthcare sector, includes radioactive wastes, instruments containing mercury, PVC plastics etc., All of these are environmentally sensitive and therefore needs a greater attention (Remy, 2001).

World Health Organization (WHO) was first to issue guidelines in this regards. In 1996, WHO released first medical document about waste management. With the advancement of medical sciences, a number of healthcare facilities have increased tremendously leading to the increased quantum of medical waste. Bio-medical waste is also one of the causative factors that adds to the problem of environmental degradation, but it is not considered as a major part of environmental management. With the higher incidences of chronic diseases like AIDS, Hepatitis B, etc., medical instruments and technologies used for treating patients and disinfectants release toxic residuary that will have a fatal impact on the environment and the community.

Realizing the importance of biomedical waste management, In 1998, Government of India, issued the guidelines to include biomedical waste management as part of hospital hygiene and maintenance. Waste collection, segregation, safe transportation, proper treatment and disposal, transport to the final disposal site and final waste disposal are the six steps that form an integral part of hospital waste management. All government as well as private hospitals is working towards enhancing the quality of waste segregation and disposal practices to meet national guidelines. Steps have been taken to replace medical waste incineration with safer and environment-friendly options of waste treatment like autoclaving, microwaving, steam treatment along with internal mixing and chemical treatment.

Understanding Bio-medical waste: According to WHO, biomedical waste can be defined as that portion of a health care or research facility's total waste stream that contain potentially infectious agents, hazardous chemicals or radioactive materials. In many countries, including India, biomedical waste management is still in its nascent stage. There is clearly a lack of understanding at the community level about the environmental hazards of biomedical waste generated by the hospital industry. The awareness levels are very low among third world countries. In India, so far as hospital waste management is concerned, gazette notification of ministry of environment dated July 20, 1998 is still the only guidelines in place. According to this document, any waste generated during diagnosis, treatment, immunization of human beings or animals or during research activities such as clinical trials carried out on animals and human beings, are defined as hospital waste. Schedule 1 of this gazette notification includes ten categories of medical waste.

Impact of medical waste on the environment: Although the side effects of medicines used for treating human beings and animals are usually investigated thorough safety and toxicology studies, the potential environmental impacts of the manufacturing and use of medicines are less understood. Some pharmaceuticals can cast effects

on bacteria and animals and may not be foolproof against safety and efficacy tests. Improper segregation of biomedical waste and different medical waste streams from the point of origin can prove hazardous to people, animals, or soil and water sources. Improper segregation and disposal of biomedical waste can potentially contaminate groundwater sources, which in turn may infect humans and animals alike. Hospital and biomedical waste needs to be properly contained to keep it away from birds, rodents, and stray animals as well as human beings. If not properly contained, segregated, and incinerated through on-site or off-site process, it can contaminate the air we breathe in through airborne particles. Radioactive particles produced by diagnostic technologies have the potential to reach a landfill or other areas of the environment, especially through the air. In turn, these air pollutants can pose health hazards to the community.

Review of literature

A good number of research articles related to biomedical waste and hospital waste have been done in recent past. Most of the literature throw light upon macro aspects of waste management and disposal strategies. Some of the articles also talk about political economy of waste management and also about the policy initiatives taken in different regions. This part provides a brief overview of some of the important articles focusing on biomedical waste management in India.

Analyzing the hospital waste management process pertaining to India, Priyadarshini (2016) argues that hospital waste is chemically hazardous, infectious, and often radioactive in nature and is a serious threat to the community. She says, the management of biomedical waste is still infant all across the world, especially in developing countries like India. Although, guidelines ministry of environment stipulates setting up of requisite treatment facility for degradation of biomedical waste, many hospitals haven't taken it seriously. In most hospitals, degradation of biomedical waste is done by incineration which results toxic chemical emissions. Himabindu (2015) is of the opinion that the quantum of waste produced in a healthcare establishment depends on the country, type of hospital, region, management practices, and types of patients. She also emphasizes on initiating a universally accepted standard procedure to dispose the biomedical waste in a safe manner. She calls for strict regulation on healthcare establishments before and after it is approved for execution.

Ranjan, Dawn, and Nirmala (2017) have investigated the biomedical waste management system in relation to policies, practices and its regulating mechanism with the standards prescribed by the Biomedical Waste (Management and Handling) Rules 1998. The study identified that the biomedical waste is managed in an unprofessional manner at every state. Large hospitals may have initiated the standard procedure to manage the biomedical waste, the same cannot be said about small clinics generating biomedical waste. Most of these clinics lack proper hygiene in managing of biomedical waste. Mohankumar and Kottaiveeran (2011) have presented a broad picture of hospital waste management and environmental problem arising out of biomedical

waste in India, including practices and compliances. According to them, developing countries are facing a serious environmental situation due to pathological waste arising out of increasing populations and the consequent rapid growth in the number of hospital units.

Most of the studies carried out on biomedical waste management in India reported that hospitals are not prepared well enough to manage it in a professional manner. The management strategy of biomedical waste requires safe handling, segregation, storage, subsequent destruction, and disposal with proper mitigation and minimization of the potentially hazardous material. Otherwise it may prove to be hazardous both for the environment as well as human beings, especially, healthcare professionals. That is exactly what is emphasized by Cebe, Dursun, and Mankolli (2013). They are of the opinion that the solid waste generated from diagnosis, treatment, clinical and pharmaceutical research may be infectious, and pathological. The clinical staff, clinical waste carriers and people who visit these hospitals are at great risk as it may cause hepatitis, AIDS, typhoid, bronchitis, anthrax, infection diseases, allergy, etc. Furthermore, chemical, radioactive, and clinical waste if not segregated properly may threaten people and environmental health too. Hence, they have called for adopting universally accepted standard procedure for biomedical waste management. Taking cues from these studies, the present paper attempts to zero in on a small area, in this case Shimoga city, to analyze the biomedical waste management practices. This may act as a prototype of many such cities in South India, to understand the strategies adopted in relation to biomedical waste disposal.

Theoretical framework

In establishing conceptual framework, this paper looks at the following factors, namely; the concepts and patterns of biomedical waste management as well as attitudes, beliefs and practices of stakeholders recommending measures of sustainable medical waste management. In spite of government of India guidelines on management of biomedical waste, being in place, hospitals across India continue to dump their medical waste into municipal bins and do not follow rules and regulations. Thus there is need to set up mechanism for efficient implementation of efficient bio medical waste procedures. The present study aims to analyze the issues related to the procedures of segregation, storage, transportation, treatment and disposal of infectious waste in the general hospitals of Shimoga city. The study specifically attempts to focus on the following objectives:

- To explore the different types of bio-medical waste generated by the select hospitals of Shimoga city and to find out their disposable pattern.
- To analyze the environmental impact of bio-medical waste in terms of possible health hazardous posed by the same.

The findings of the study may help hospital administrators as well as other interested stakeholders of Shimoga city in finding out the cost effective technologies used for treatment as well as disposal of bio-medical waste.

Methods and materials

The methodology for this research includes field observation and empirical data collection through questionnaire based survey and interviews. A structured questionnaire was designed to collect information with regard to generation of biomedical waste from different types of health care establishments. In-depth interviews of healthcare professionals involved in hospital administration and management, were arranged in order to understand the existing management practice of disposal of biomedical waste. Structured questionnaires were circulated among health professionals working in select hospitals of Shimoga city. 100 respondents from governmental hospitals and 100 from private hospitals respectively were administered the questionnaire. Respondents were selected on the basis of multistage random sampling method. The data collected through the survey were analyzed using descriptive statistics. Along with statistical description, the data was also put through qualitative analyses in order to understand the existing biomedical waste management practices in the city.

Results and Discussion

The present study has classified biomedical waste generated by hospitals of Shimoga city categories like medical waste, chemical waste, radioactive waste and general waste. The medical waste further categorized into Kitchen waste, manmade waste, dry waste, sharps and infectious waste which include syringes with needles, blades, scalpels, saws, broken pieces, glasses, pipettes, blood vials, culture dishes etc.. The non- sharp category includes used blood and blood component bags, blood vials, disposable surgical equipment such as bypass tubing, surgical sponges, tapes, drapes saturated with blood, patient dressing etc. and are generated in practically all hospitals. Chemical waste includes rejected disinfectants and insecticides. Segregation of medical waste helps to reduce total treatment cost by preventing the non infectious general waste to become infectious as only 17% of the hospital waste is infectious while 83% of the waste is non infectious.

Biomedical management guidelines: According to the guidelines given in schedule I of biomedical (handling & management) rules of 1998 given by central government, yellow bags should be used for segregation of anatomical waste and red bags should be used for non sharp infectious waste. In the study it is evident that yellow plastic bags which should be used for segregating animal anatomical tissues is used by 94.37% of the private hospitals and only 61.27% government hospitals make use of yellow plastic bags for segregation of organs, tissues, placenta etc., Red bags are used by 81.3% government hospitals and 95.41% of private

hospitals which are mandatory for segregation of non sharp waste infected waste. It was observed by the researcher, that healthcare workers are not aware as to how to use red and yellow bags. Due to non availability of both the color code bags at the same time most of the hospitals fail to segregate them according to the guidelines issued by the government. Needles, burners or cutters should be used for segregation of infected sharp waste, so as to avoid accidental injuries. However, needle pricks are used by only 51.3% of the government hospitals. But, it was observed that all the private hospitals use them. Although, 81.4% of government hospitals and 78.1% of private hospital wards are equipped with needle cutters and burners, during the visit it was observed that in most of these hospitals they are not in working conditions.

Responses of nurses and sweepers: So far as responses of nurses and sweepers regarding different color code bags, materials used for different categories of biomedical waste are concerned, 95.6% of nurses professionals working in private hospitals and 63.2% of them working in government hospitals use black bags for segregation of kitchen waste. But when it comes to sweepers' responses, only 53.6% of them belonging to private hospitals and 69.1% of them working in government hospitals use black bags for kitchen waste segregation. The disparity in the responses of nurses and sweepers is very significant. According to the responses of sweepers, dry waste is segregated in black bags in 79.1% of government hospitals, while 71.2% of them working in private hospitals use black bags for collecting dry waste. The study revealed that 61% of nurses working in government hospitals and 43.4% from private hospitals disinfectant sharp waste before its disposal.

Biomedical waste segregation: In the study, it is very obvious that 72.8% of government hospitals and 76.64% private hospitals use red bags for segregation of infected disposable gloves but only 6.3% of private hospitals and 3.5% of government hospitals make use of yellow bags. 20.71% of the government hospitals and 6.8% of private hospitals disinfect the used gloves before disposal. The study revealed that 82% of government hospitals and 73.6% private hospitals use red bags for segregation of blood stained infectious waste while 4.2 % government hospitals and 14.7% private hospitals use yellow bags for the same. It is very disheartening to know that 16.2% government hospital nurses are unaware of segregation procedures for infected non sharp medical waste.

Disposable syringes are used practically by all the government and private hospitals. Needles are cut into pieces or burnt in 89.1% of government hospitals and 77.3% of private hospitals so that the needles get separated from the plastic syringes. The hub of the syringes should also be cut so that it cannot be reused by illegal means, but it is evident from the study that only 7.6% government hospitals and 24.7% private hospitals disfigure the syringes by cutting their tips. The study clearly shows that only 78.1% of government hospitals and

54% of Private hospitals disinfect their detached needles by immersing them into hypochlorite solution. 88.1% government hospitals and 76.2% Private hospitals dispose of the needles in puncture proof containers.

The study revealed that in 97.5% of the hospitals, segregation of the medical waste is done at source and before collection. The sweepers segregate the medical waste by hand in 96.4% hospitals. Though according to the responses given by the sweepers both liquid and solid waste are separately collected, the researcher observed that in majority of the hospitals liquid waste is directly poured in common sewerages. 84.2% hospitals send their medical waste from the wards to the storage place once the bags or containers are 3/4th full but only 25.3% of the hospitals mark hazardous signs on the bags. 95% of the hospitals tie the bags containing medical waste and do not seal them. Only 4.7% of the private hospitals seal the bags containing infectious waste. Both, govt. and private hospitals more or less follow the same methods and procedures. 64.2% of government hospitals and 71.8% of private hospitals use chemicals to disinfect their infectious waste and only 6.4% of government hospitals and 17.21% of private hospitals use autoclave for disinfecting medical waste. Microwaves, and sterilizers are not used in any of the hospitals of Shimoga City for disinfecting medical waste. It was found that the majority of the hospitals (93%) use sodium hypochlorite, hydrogen peroxide, iodine, carbolic acid, phenyl etc, for disinfecting biochemical waste. Needle cutters are the only equipments used for segregation. The detached needles are then disinfected by use of chemicals. Only 4.1% of the hospitals use autoclave for disinfection.

Disposal of biomedical waste: According to the administrators 41.3% of the government hospitals use trolleys to transport medical waste from wards to storage place while only 17.3% of nurses and 19.2% of sweepers said that they were using trolleys for transportation. There are lot of discrepancy in the responses of administrators, nurses and sweepers. However nurses and sweepers responses are quite similar. The study found that the high percentage of (93.1%) of government hospitals have separate place for infectious waste but only 5.1% of the storage places are marked with warning signs. Though the storage place for infectious waste should be always kept under lock, it was found that 64.1% and 43.6% of government hospitals lock their storage room for infectious waste. This is very dangerous, as it was noticed, that in some of the hospitals, stray dogs, and rats etc., enter the room in search for food and scatter the infectious waste. If the storage place for infectious waste is not locked, then rag pickers can take out syringes for selling. The sold syringes are then repacked and reused specially in smaller rural hospitals that are very dangerous for the society.

The study revealed that, in most of the hospitals have not installed incinerators and those hospitals, which previously had incinerators in their hospitals have stopped using them and send their biomedical waste to

common waste treating facility. Govt. hospitals (74.8%) and private (64.4%) dispose their liquid waste through sewerages while only 25.7% government hospitals disinfect the liquid waste before its disposal through sewerage. The study show that PVC containing waste is incinerated by 3.1% of the government hospitals and 4.2% private hospitals. This clearly indicates that some of the government and private hospitals send their PVC waste along with the waste to be incinerated it releases toxic emissions.

Safety measures: It is very evident from findings that all the medical waste management personnel use gloves for their personal safety. Masks are used by approximately 84.3% of hospitals workers. Aprons are not used in most of hospitals except in the operation theatre; but uniform is worn by all the waste management personnel. Disinfectants are used for personal safety in more than 91.3% of the hospitals. The study clearly shows that administrators of 91.4% of the government hospitals as well as private hospitals were aware of the legislation applicable to hospital waste management. In comparison, 73.8% of the nurses from government hospitals and 63.7% from private hospitals were aware of the legislation applicable to biomedical waste management. The researcher recommends that continuous awareness should be prompted among the healthcare personnel such as doctors, nurses, sweepers, patients, their relatives and the transporters who collect the bio medical waste from the hospitals and take it to the common waste treating facility.

Conclusion

Biomedical waste management is at a nascent stage in India and the city of Shimoga is no exception to this. Notwithstanding the hazards it may cause on the environment, city administrations across the country have not considered it as an integral part of waste management of the city. Stand alone policy initiatives or guidelines pertaining to biomedical waste management are not in place at the city corporation level. In fact, hardly there is any difference in handling domestic waste and biomedical waste. Sewage plant, waste management plants in Shimoga, treat all kinds of waste alike. As it was found and explained in the earlier parts of this paper, most of the hospitals in Shimoga haven't taken the issue of biomedical waste management seriously.

As a concluding remarks it can be said that, although biomedical waste management guidelines issued by the central government, are very much in place since 1998, hospitals in Shimoga have not been too keen in following the same, both in letter and spirit. City dwellers, various establishments like hotels, industries, institutions, and hospitals, etc., generate loads of waste every day. Both the city administration as well as respective owners of these establishments and individual households are equally responsible in managing the same. As far as biomedical waste management is concerned, individual hospitals and allied centers should

strictly adhere to the existing norms. The city administration should also treat biomedical waste differently from that of other waste and may consider setting up of a separate plant for managing them. It is high time, that the hospital management, health care personnel, patients and citizens of city should join hands in managing biomedical waste safely and efficiently in order to mitigate the health as well as environmental hazards it may cause.

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