

MANAGEMENT OF BIO-MEDICAL WASTE: AWARENESS AND PRACTICES IN HOSPITALS IN DELHI**Dr. Shankar Choudhary^{#1} and Richa Hirendra Rai^{*2}**

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ABSTRACT

Introduction: This is a small review on the awareness of Management of Biomedical waste among the staff in hospitals in Delhi. We are also trying to make aware as to what are the different kinds of waste in the hospitals. **Review Results:** The results of our survey were quite positive and indicate that most of the staff in hospitals in Delhi are aware of the types of Biomedical waste. **Discussion:** To throw further light on the aspect we have also tried to discuss WHO fact sheet reports to enhance the knowledge of the readers on waste generated by health care activities, their hazards, the realisation of moral responsibilities by citizens or staff of the hospitals, the biomedical waste and its by-products as cited by WHO and many other kinds of literatures.

KEY WORDS: Biomedical waste management, Delhi, hospital staff, waste management responsibilities, types of biomedical waste.

INTRODUCTION

On a wider perspective waste which is produced during the prophylaxis, diagnosis or treatment of society is called Biomedical waste. In India, where there is no common health care system, and being a mixed set up of both Government and private organisations the estimated waste generation has to be quite high. It was estimated to be between 0.5 and 2.0 kg/bed/day and annually about 0.33 million tones in 2001.^[1] WHO fact sheet reported that from total of waste generated by health care activities 20% are hazardous.^[2]

Till July 1998, there being no system for proper waste disposal most of the hospitals were disposing their waste along with general waste, thus for prevention of these improper practices, the Government of India had launched a law known as "Bio-medical Waste (Management and Handling) law 1998".^[3] Under this law the Government has given specific guidelines for management of bio medical waste. The law states the time schedules, required biomedical waste treatment facilities like incinerator, autoclave, microwave system, etc.

According to the Central Pollution control board- CPCB annual report of 2016, total quantity of Biomedical Waste generation in the country is approximately 517 tonnes per day (TPD). Besides, as per a joint report by Associated Chambers of Commerce and Industry of

India (Assocham) and Velocity in 2018, the total quantity of medical waste generated in India is 550 TPD, and these figures are likely to increase close to 775.5 TPD by 2022. To take a control over this situation several common bio-medical waste treatment facilities (CBWTFs) are in operation and many others under construction (CPCB, 2017). However according to them such facilities is not economically feasible for considering non-availability of funds for operation, non-compliance with segregation of such wastes at the Health care facilities level and non-payment of fees by them to the CBWTF personnel as well as they too have agreed that there is leniency in observing rules in several health care establishments. Several measures and their extension dates have been discussed in this report as prescribed in the WHO Blue Book, 2014. But overall this blog conveys that most of Health care facilities are not ready to take up this moral responsibility.^[4]

It is important to understand that though the infectious waste is only estimated to be 10% of the total waste generated, but it has a tremendous potential to get mixed with the non infectious general waste. Moreover, the improper disposal of the waste also invites vector borne problems in the society.

This study was taken up with the objective to assess the awareness of waste disposal among medical practitioners and nurses.

METHODOLOGY

Around 20 hospitals with more than 35 beds minimum were randomly selected from South Delhi. The doctors and nurses of these hospitals, who were working there since minimum 1 year, were the study population. It was ensured that all the doctors and nurses under the study population were aware about the existence of such a law for biomedical waste disposal. Around 5 doctors and 5 nurses were asked to fill up the questionnaires.

A predesigned questionnaire was used for data collection from the subjects under the preview. They were asked about presence of manual or guidelines of document on management of hospital wastes in their hospital, about presence of waste management plan in the hospital, presence of waste management team in the hospital, about presence of clearly defined procedure for management of waste from specified units in the hospitals, whether waste management responsibilities were included in the job description of hospital supervisory staff, and whether training is given to hospital staff for waste management- as closed ended questions.

Also to understand their knowledge on different kinds of wastes- and to identify them, a table was presented to them.

Table 1: shows the percentage of doctors and nurses who marked the definition of the following wastes correctly as given.

Awareness on Kind of Biomedical waste	Doctors (n=100)	Nurses (n=100)
Sharps	100%	99%
Pathological waste	99%	98%
Infectious waste	98%	85%
Radioactive waste	99%	80%
Chemical waste	99%	90%
Pharmaceutical waste	100%	100%

As in our study it was noticed that most of the doctors and nurses were well versed with the kinds of biomedical waste, as also seen in other studies done by Bansal M et al in 2013 and also supported by Qureshi W et al.^[5,6] These authors along with others, have quoted that education plays an important role in developing the level of understanding required for this procedure.^[5-7]

But there have also been studies which have concluded that the medical and paramedical staff has least knowledge about the health hazards as well as procedures of waste disposal and management. There were studies in which authors have also quoted that majority of the doctors in their study believed that incineration was the best method for waste disposal. However the guidelines from WHO have specified that sometimes incineration emits such fumes which are quite harmful toxins and can affect the society at large. The authors were also concerned that most of the doctors in their study were not ready to take the responsibilities of

Interview of the subject participants was done after informed consent and data collected was studied in terms of percentage and proportion and confidentiality was maintained.

Data analysis and Interpretation

Around 100 doctors and 100 nurses were thus interviewed. 100% doctors and 99% nurses were aware that there are legislations applicable to hospital waste management. Also all the hospitals under the study were having a manual/guideline document for waste management and also 99% of them had a Waste Management plan with a Waste management team with a team leader and members along with waste handling staff. 95% of them had defined procedures as per the subjects under the study and in rest 5% they were being designed and were to be intimated soon. Most of them, i.e. 60% of doctors and 80% of nurses were not sure whether waste management responsibilities were included in the job description of hospital supervisory staff. 90% of hospitals were providing in-house awareness programs-tutorials, for hospital staff, not training.

waste disposal. Concern has also been raised about the subordinate staff having least knowledge of any of the above. Under bio-medical waste (management and handling) law 1998; the heart of law is segregation at origin. Segregating potentially infectious material from the other waste at the point of generation may reduce both volume and cost.^[8]

Lack of equipment, inadequate physical spaces for storage, poor waste separation, and unsafe sterilization and disposal were among the most important issues in the literature along with less awareness and knowledge of the same.^[9] However, these authors have also suggested that adequate training and support from all stakeholders helps to control and improve the conditions in any country. Publishing educational booklets, holding workshops, providing enough waste bags, Sticking labels depicting which kind of waste to be disposed in it, accessibility of proper storage, monitoring, segregation and transport and regular audits from health care

management system of a country also makes a huge difference.

There are several association in India who have thus taken up this job and provide their services for training and education just quoting a few of them.^[10,11]

RELEVANCE AND CONCLUSION

With the prevailing improving scenario of education and awareness and central pollution control board trying to establish strict norms and adverse consequences on failing to comply, we found that most of the nurses and doctors were well aware of the kinds of Biomedical waste, which was not the scenario in the earlier years. Having said this we would also like to highlight certain gest of facts as per WHO health care waste management.^[12] They have detailed in their fact sheet that:

Around 85% is general non-hazardous waste and remaining 15% is considered hazardous material that may be infectious, toxic or radioactive. As per what we studies in literature that most of the doctors still believe in incineration. However as per WHO fact sheet open burning and incineration of health care wastes can, under some circumstances, result in the emission of dioxins, furans, and particulate matter which are harmful. They have also tried to explain in the fact sheet that waste and by-products cover a diverse range of materials

- Infectious waste: waste contaminated with blood and other bodily fluids (e.g. from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients with infections (e.g. swabs, bandages and disposable medical devices)
- Pathological waste: human tissues, organs or fluids, body parts and contaminated animal carcasses;
- Sharps waste: syringes, needles, disposable scalpels and blades, etc.;
- Chemical waste: for example solvents and reagents used for laboratory preparations, disinfectants, sterilants and heavy metals contained in medical devices (e.g. mercury in broken thermometers) and batteries;
- Pharmaceutical waste: expired, unused and contaminated drugs and vaccines;
- Cytotoxic waste: waste containing substances with genotoxic properties (i.e. highly hazardous substances that are, mutagenic, teratogenic or carcinogenic), such as cytotoxic drugs used in cancer treatment and their metabolites;
- Radioactive waste: such as products contaminated by radionuclides including radioactive diagnostic material or radiotherapeutic materials; and
- Non-hazardous or general waste: waste that does not pose any particular biological, chemical, radioactive or physical hazard.

The WHO fact sheet^[12] also states that the major sources of health-care waste are:

- hospitals and other health facilities
- laboratories and research centres
- mortuary and autopsy centres
- animal research and testing laboratories
- blood banks and collection services
- nursing homes for the elderly.

With High-income countries generating on average up to 0.5 kg of hazardous waste per hospital bed per day; while low-income countries generating on average 0.2 kg. However, health-care waste is often not separated into hazardous or non-hazardous wastes in low-income countries making the real quantity of hazardous waste much higher.^[12]

They have discusses the health risks from the Health-care waste which contains potentially harmful microorganisms that can infect hospital patients, health workers and the general public. Other potential hazards may include drug-resistant microorganisms which spread from health facilities into the environment.^[12]

Adverse health outcomes associated with health care waste and by-products^[12] also include:

- sharps-inflicted injuries;
- toxic exposure to pharmaceutical products, in particular, antibiotics and cytotoxic drugs released into the surrounding environment, and to substances such as mercury or dioxins, during the handling or incineration of health care wastes;
- chemical burns arising in the context of disinfection, sterilization or waste treatment activities;
- air pollution arising as a result of the release of particulate matter during medical waste incineration;
- thermal injuries occurring in conjunction with open burning and the operation of medical waste incinerators; and
- Radiation burns.

Environmental Impact as discussed in fact sheet cited by WHO^[12] are as follows:

- Treatment and disposal of healthcare waste may pose health risks indirectly through the release of pathogens and toxic pollutants into the environment.
- The disposal of untreated health care wastes in landfills can lead to the contamination of drinking, surface, and ground waters if those landfills are not properly constructed.
- The treatment of health care wastes with chemical disinfectants can result in the release of chemical substances into the environment if those substances are not handled, stored and disposed in an environmentally sound manner.
- Inadequate incineration or the incineration of unsuitable materials results in the release of pollutants into the air and in the generation of ash residue. Incinerated materials containing or treated

with chlorine can generate dioxins and furans, which are human carcinogens and have been associated with a range of adverse health effects. Incineration of heavy metals or materials with high metal content (in particular lead, mercury and cadmium) can lead to the spread of toxic metals in the environment.

- Only modern incinerators operating at 850-1100 °C and fitted with special gas-cleaning equipment are able to comply with the international emission standards for dioxins and furans.
- Alternatives to incineration such as autoclaving, microwaving, steam treatment integrated with internal mixing, which minimize the formation and release of chemicals or hazardous emissions should be given consideration in settings where there are sufficient resources to operate and maintain such systems and dispose of the treated waste.

Even though the recent laws have made segregation of so many materials quite simple however there are hospitals in the reviewed literature which have not followed the stipulated laws. As discussed in studies certain health care facilities were not using needle shredder and they disposed all sharps with other waste.

It was also noticed that hospitals were not using disinfecting method for waste. Also many did not have special system for waste collection from origin to final disposal site. It was surprising to see that many hospitals were disposing their waste by open air burning or were throwing waste in open field, without any pre-treatment. Some of them did not have any record keeping system about amount of waste generation. They were not keeping record for injuries occurred to health personnel, during their routine work. There are hospitals which did not know about authorization that they have to take from Central Pollution Control Board. They also didn't know about annual report submission to pollution control board and thus deter or are not willing to participate in the safe practices for management of biomedical waste and thus inviting Environmental issues as discussed above. Thus the pollution control board had to take strict measures.^[4]

Though our cross-sectional study has shown quite a positive result both the private as well as government health establishments should undertake vigorous training programme for the doctors, nurses, the supportive staff, and all the stake holders to tackle this grave issue.

Also students are being made well aware by enforcing such subjects in their curriculum and their practical importance, while in the grooming years- but they need to consider the seriousness of the problem. With development of new technologies things have become quite effective with little efforts and ironically also more complex, but awareness, in medical, paramedical as well as community at large, plays an important role.

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