

**BIOMEDICAL WASTE MANAGEMENT:
A CASE STUDY OF DISTRICT HEADQUARTER HOSPITAL, JAJPUR, ODISHA**
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ARTICLE INFO
Article History

Received on 18th Oct 2021

Received in revised format 18th Nov 2021

Accepted on 3rd January 2022

Keywords

 Medical waste, District
Headquarter Hospital, Jajpur,
Odisha, Management

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ABSTRACT

The investigated Jajpur District Headquarter Hospital is always congested by the large numbers of patients. A pilot study was conducted in this hospital to gather data on waste generation and its management practices. A questionnaire survey is conducted for collecting the required data, relating to the type of generated waste, the process of segregation and handling, storage. The questionnaire was also used to assess the continuous training program for waste handlers, through interviewing the staff responsible for waste management. Category wise infectious biomedical waste in different months of 2017 (January, February and March) at Jajpur District Head Quarter Hospital is also studied. The average collection of infectious biomedical waste (ward wise) per day at Jajpur District Head Quarter Hospital in the year 2017 is assessed. It is found that around 23.4%, the waste generated in this hospital is infectious. On an average about 219 kg of non-infectious and 67.145 kg of infectious waste are generated per day (about 1.395 kg per day per bed, gross weight comprising both infectious and non-infectious waste). Different management practices followed by this hospital are also summarised. Looking into the quantum of waste generation, the researchers felt that there is an urgent need for incinerator installation.

Introduction

Wastes generated from the hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, etc. are known as biomedical wastes. Though the quantum of hospital waste is about 1/5th of municipal waste only, the potentiality in vector generation and disease transmission is higher. Biomedical waste can be classified into non-Risk Waste (75-90%) and Risk Waste (10-25%). Quantity of hospital waste and biomedical waste generation in Indian hospital is 1 – 2 kg/bed/day and 150-200gm/bed/day respectively (Baveja, G., et al., 2000; Manohar, D., et al., MoEF, 1998; Shah, S., et al., 2001; Patil and Pokhrel, 2005; Mathur, P., et al., 2012; Sharma and Chauhan, 2008).

Effective management of biomedical waste is not only a legal necessity but also a social responsibility.

In country like India, where there is big and complex health care system, mixed economy, private and Government hospitals working together; health care facilities generate good quantum of hospital waste. A

number of studies have been carried out in different aspects of biomedical waste management for a number of private and Government hospitals in and around different cities of India (Mathur, V., et al., 2011; Mathur, P., et al., 2012; Narang, R.S., et al., 2012; Chudasama, R.K., 2013; Basu, M., et al., 2012; Datta, P., et al., 2018; Rao, D., et al., 2018). The innovative methods of hospital waste management have also been explored and studied in different parts of the world (Messerle, V.E., et al., 2018; Nangbe, F., 2018; Alam, I., et al., 2019; Ali, M., et al., 2016a, b; Farzadkia, M., et al., 2015; Amouei, A., et al., 2015). These studies explicitly demonstrate that there is lack of knowledge and awareness on hospital waste management among the employees of the studied health care systems and facilities, which affects the safe practices for management. The national policy should be such that these employees should be facilitated for vigorous training programmes. It is the high time that the subject is included in the curricula of the medical education (Vasistha, P., et al., 2018; Rajan, R., et al., 2019).

In Odisha, the government hospitals at district headquarters are heavily congested and the private operators account very less share of the total healthcare facilities in the state compared to other states of India. So earlier, it is impossible to manage biomedical waste properly for the waste handler but after the introduction of a law that is Biomedical Waste Management Rules, 1998 (amended 2018), it is compulsory for the service provider to manage the biomedical waste at the point of generation, no matter it is private or government hospital. Each healthcare institution having more than 10 beds needs to be disposed of the biomedical waste according to the rule (MoEF, 1998; WHO, 1997; Jaswal and Jaswal, 2000).

MATERIALS AND METHODS

A pilot study was conducted in healthcare settings of a District Head Quarter Hospital during 2017 at Jajpur, Odisha, India. Data were collected from different wards of this investigated hospital. This is a general Government hospital located in the District Headquarter and considered to be a large hospital based on the number of beds, as it had more than 200 beds.

A survey questionnaire for waste management obtained from WHO was modified and used in collecting the required data, relating to the type of generated waste, the process of segregation and handling, storage (waste storage areas were observed for location, width, and cleanliness), and policies of biomedical waste management (WHO, 1997). The questionnaire was also used to assess the continuous training program for waste handlers, through interviewing the staff responsible for waste management as undertaken by other researchers (Baveja, G., et al., 2000; Manohar, D., et al., Patil and Pokhrel, 2005; Soliman and Ahmed; 2007; Sharma and Chauhan, 2008). SPSS package was used for the statistical analysis of the data obtained (Gupta, S.P., 1998). Waste items from healthcare settings were categorized into six types (1, 4, 5, 6, 7, 9) out of following categorised wastes (MoEF, 1998; WHO, 1997).

Category	Type of Waste
1	Human anatomical waste
2	Animal waste
3	Microbiology and biotechnology waste
4	Waste sharps
5	Discarded medicine and cytotoxic drugs
6	Solid waste (cotton, dressing, plasters)

7	Solid waste (generated from disposable items)
8	Liquid waste
9	Incineration ash
10	Chemical waste

RESULTS AND DISCUSSION

Jajpur District Head Quarter Hospital is a multispecialty hospital having 205 beds. Though this hospital is having 205 beds, the bed occupancy rate is higher than 100%. Biomedical waste management is executed here in this hospital by the outsourced agency.

According to Biomedical Waste Management and Handling Rule amended in 2016 the wastes are collected in 4 colour coded containers in the Jajpur District Head Quarter Hospital (Table 1). Biomedical wastes are segregated and disposed of at Jajpur District Head Quarter Hospital as follows.

1-YELLOW-Human Anatomical Waste Human tissues, organs, body parts and foetuses below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time). Soiled waste items contaminated with blood, body fluids like dressings, plaster, cotton swabs and bags containing residual or discarded blood and blood components. Discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask, gown and blood bags.

2- RED- Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes without needles, fixed needle syringes with their needles cut, and gloves.

3-WHITE -Waste Sharps including metal needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps

4- BLUE- Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.

Category wise infectious biomedical waste in different months of 2017 (January, February and March) at Jajpur District Head Quarter Hospital is presented in Table 2. The average collection of infectious biomedical waste (ward wise) per day at Jajpur District Head Quarter Hospital in the year 2017 is provided in Table 3. Table 3

demonstrates that on an average about 219 kg of non-infectious and 67.145 kg of infectious waste is generated per day (about 1.395 kg per day per bed, gross weight comprising both infectious and non-infectious waste).

Biomedical wastes are generated in the wards and then later transferred to the nursing duty room. The ward boys segregate the biomedical waste according to the above-discussed rule and pour it in the respective dustbins. Though biomedical waste should be segregated at the point of generation, due to heavy workload, the actual process cannot be done here in this hospital. This is not only the case of this hospital but also of all District Headquarters Hospitals of Odisha Government. Then the staff of the outsourcing agency takes the waste to the containment area with a wheelbarrow. They also maintain a register regarding the amount of waste generated in each ward. In the containment area, soiled waste is first autoclaved and then deep buried in the deep burial. Placentas are directly deep buried in deep burial. Plastics are shredded in the shredder machine. Needles are terminated in needle hub cutter. General wastes are landfilled or taken by the Municipality.

To avoid infections, sterile, waterproof gloves are used by the ward boys and staff of the outsourcing agency. All wastes are stored and disposed of in bags that won't leak. Containers are marked or labelled with different colours. Disposable scalpel blades, needles, syringes, and other sharp things are put into puncture-proof containers. Waste that's contaminated with blood or other bodily fluids is double-bagged before it's handled, stored or moved. Disposal of medical waste here in this hospital adheres to Biomedical Waste Management Handling Rules (amended from time to time). The provisions of this Rule are strictly followed in this hospital. In a very similar manner, biomedical wastes are disposed of in all the district headquarter hospitals of Odisha. However, it is pertinent to mention here that none of District Head Quarter Hospitals of Odisha have incinerator and ETP (Effluent Treatment Plant). Nevertheless, DHHs are managing effluent by a Low-cost ETP model.

RECOMMENDATIONS

Some suggestions were made to the hospital staff, which were appreciated. The following suggestions are enumerated for better waste management (Baveja, G., et al., 2000; MoEF, 1998; Shah, et al., 2001; Sharma and Chauhan, 2008; WHO, 1997).

- Segregation of waste according to colour coding system should be done at the point of generation.
- Strict guidelines and policies for the management of waste should be written in the hospital wall.
- Drawings of various colour-coded bins with the separate categories of waste for different bins should be labeled clearly in the wall in each department for the acknowledgment of the staff dealing with the waste.
- Needles should be strictly cut by the hub cutter
- All staff dealing with waste must wear personal protective equipment before handling waste.
- Gloves and masks should be mutilated and shredded.
- Disinfection procedure must be included with 1% bleaching powder solution after the mutilation of the needle and before final disposal.
- A centralized bin system for the collection of waste should be implemented.
- Sharp pit and deep burial must be made inside the hospital premises or in a place suitable to the hospital without compromising public health.
- The infectious wastes be collected separately from the Laboratory and OT and should not be transported through the patient area.
- Rather than replacing the polyethylene bags in the respective bins (with periodic disinfection of the bins), the bins should be collected each time and replaced with clean bins with the polyethylene bags already in them. The collected bins should be carried in separate trolleys to minimize the possibility of spillage.
- Periodic meetings should be conducted involving administrative and maintenance staff who are directly or indirectly involved with waste management in order to share and discuss the technical or practical difficulties and provide suggestions that may be specific to a particular hospital and region.
- As there is a need for orientation programs for newcomers to understand the hospital function, they should be trained effectively before joining their work. Thus, an induction training programme and Regular training programs about statutory public health guidelines for BMW management with a focus on mass education and motivation and change of mindset in all strata of medical practices should be imparted. It should be supported by appropriate education, training and

the commitment of the healthcare staff, management and healthcare managers within an effective policy and legislative framework.

- Regular up-gradation of technology for waste management and compliance with the Environmental Protection Act, 1986 should be done effectively.
- Mixing of infectious waste and noninfectious waste should not be done.
- Hospital waste must be segregated properly so that infected waste does not land into the municipal site meant for general waste.
- The hospital should have an incinerator and must have an ETP for the treatment of generated liquid waste so that before discharging into the municipal drains, it meets the requirement of all parameters as stipulated in BMW (M & H) Rules, 1998.
- Every healthcare facility should take authorization from the concerned pollution control board for handling BMW generated in its premises.
- Repeated reinforcement of education regarding the management of biomedical waste has to be done until it becomes a habit.
- There should be close monitoring of the compliance with surprise and daily checks. A team should be constituted by a health care facility to proactively and consistently monitor BMW management so that deviations could be corrected promptly.
- Awarding the Hospitals that are found continuously in compliance with BMW Management.

CONCLUSION

In general, the management and treatment of biomedical solid waste in this studied hospital conformed to the Bio-medical Solid Waste Rules (Management and Handling), 2016. At present, the hospital has 205 beds. The total amount of non-infectious and infectious waste generated is approximately about 219 and 67.145 kg/day, respectively. Thus, there is an urgent need for incinerator installation. About 23.4%, the waste generated in this hospital is infectious. The hospital administration should install an incinerator at the earliest and may extend this incineration facility to the clinics and nursing homes operating in the area.

It is inferred that in the field of medical practice, statutory public health guidelines for Biomedical Waste Management and close monitoring of its compliance

alone, cannot achieve the ultimate goal if it is not accompanied with social science approach of mass education motivation and change of mindset in all strata of medical practice. Continuous logistic support and user-friendly approach are equally important while implementing any rules, and regulations concerning the medical practice. To improve the awareness of BMW management, firstly the hospital management should be more involved in the waste management system and secondly, the importance of this subject should be emphasized on everyone concerned. This would be possible by creating awareness about biomedical waste management amongst the public, patients and hospital staff.

Regular training and monitoring should be conducted in both state and district levels keeping in view the importance of proper disposal of biomedical waste.

Acknowledgements: The authors are indebted to CDMO, ADMO (Medical) of Jajpur District for providing necessary permission and research facilities for the present study.

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Table 1. Colour coding, type of container, treatment for disposal of biomedical wastes at DHH, Jajpur

Colour Coding	Type of Container	Waste Category	Treatment at DHH Jajpur
Yellow	Plastic bag	1	Deep burial
Red	Disinfected container /plastic bag	6	Autoclaving
Blue	Plastic bag	7	Autoclaving, chemical treatment and shredding
White translucent	Puncture proof container	4	Chemical treatment ,shredding
Black	Plastic bag	5, 9, 10	Secured landfill

Table 2. Category wise infectious biomedical waste in the first quarter of the year 2017 at Jajpur District Head Quarter Hospital

Month	Category 1 (Yellow) in Kg	Category 6 (Red) in Kg	Category 7 (Blue) in Kg	Category 4 (PPC - (Puncture Proof Container: White) in Kg
January	341	976	284	83
February	312	921	324	120
March	365	879	335	93

Table 3. Average collection of infectious biomedical waste (ward wise) per day at Jajpur District Head Quarter Hospital in the year 2017.

Ward	Yellow	Red	Blue	PPC (Puncture Proof Container)
Medicine	300gm	2.1kg	2.7kg	750gm
Surgery	2.1kg	250gm	300gm	60gm
Labour room	6.26kg	30.1kg	2.1kg	500gm
Operation Theatre	1.5kg	300gm	200gm	150gm
Obesitics & Gynogenic	2.5kg	350gm	200gm	700gm
Paediatric ward	300gm	750gm	1.4kg	550gm
Post Portem Care	Nil	300gm	100gm	400gm
Laboratory	250gm	350gm	140gm	550gm
Blood bank	200gm	200gm	160gm	85gm
Dressing room	300gm	300gm	2.1kg	350gm
Diarrhoea ward	Nil	1.1kg	2.9kg	250gm
Sick New Born Unit	200gm	300gm	90gm	100gm