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An Overview on Biomedical Waste Disposal and its Management

Vinodhini R.¹, Geetha S.¹, Ashok K. ², Babu M.² and Vasukidevi Ramachandran^{2*}

¹Department of Biomedical Engineering, and ²Department of Microbiology and Biotechnology, Faculty of Arts and Science, Bharath Institute of Higher Education and Research, Chennai-600073, Tamil Nadu, India

**Corresponding Author*

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Abstract: Proper disposal of bio-medical waste (BMDW) is a problem that both public bodies and non-governmental organisations (NGO) have acknowledged. Adequate precaution should be taken to remove several risks and hazardous chemicals containing them. Inadequate and inadequate systems for segregation and transportation can pose serious problems for society and higher risk to exposed workers, patients and the population to biomedical dangers. A timely regulatory and legislative policies and procedures are necessary in order to increase the pace at which appropriate processing and management methods are developed. They need to be characterised. It is difficult to adequately isolate, manage and remove wastes. Safe and effective management is not only a juridical necessity, but also a social responsibility for BMDW. Some of the problems in proper management of hospital (HSP) waste are a lack of care in people working in that field, less motivation, awareness, and cost factor. In different practises appropriate surveys of waste management procedures are needed. Education on the dangers of unsafe waste disposal is clearly necessary. An efficient engagement approach is essential in view of the low level of knowledge of BMDW management by various categories of workers in healthcare (HLC) centres. A major direction for future studies will be to plan global and quantitative and qualitative evaluation of BMDW flows.

Keywords: BMDW management, COVID-19, Biomedical waste, WHO

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Introduction

Hospitals (HSP) produce a large amount of waste that can pose environmental and health dangers. The Government of India (GOI) has from time to time reviewed the provisions in order to optimise waste generation, recycling and disposal activities. The GOI released on 28 March 2016, in its super session of 1998 Rules of BMDW Management, the "BMDW Management Rules, 2016." Several amendments and additions to the current Rules

for BMDW management were introduced in 2016 to further enhance the environmental collection, separation, storage, and recycling of the BMDW (Chavan and Gupta, 2004; Chongtham *et al.*, 2015; Sharma *et al.*, 2016, 2018).

Under the current regime, vaccine camps, blood-giving camps and surgical camps, and pre-treatment with lab waste, blood samples etc. have been expanded. The coverage has been increased.

The method of categorising and authorising waste has been streamlined. The rules specifically define the responsibilities of the employee, i.e. health care (HLC) and general BMDW processing facility operator. In the interest of the general public, the 2016 Regulations for BMDW Management, as revised on the 28 March 2018, is further amended (Gupta *et al.*, 2019; Chavan, 2020; George and Gupta, 2020; Mohan *et al.*, 2020; Yadav *et al.*, 2020).

A major factor of waste management was the framing of the regulations; moreover, the application of the regulations allowed the medical (MED) fraternity to understand and take them in the professional environment. In view of India's regional expansion and the scale of its MED industry, this has been and remains a difficult challenge (Longe and Williams, 2006; Idowu *et al.*, 2013; Ramkrishna and Satyanarayana, 2018). Toxics connection has been involved in the education and training of health practitioners about the treatment of MED waste in HSP's and in other health facilities. Srishti stresses the importance of management interventions and the commitment of workers to implementing effective waste management activities. It works to dispel the conviction that science is the only solution for the disposal of MED waste (Idowu *et al.*, 2013; Ramkrishna and Satyanarayana, 2018).

BMDW management is a dynamic task involving multiple actors both within and outside the health sector (Fig. 1). Other major players in the field of BMDW treatment are other industries apart from the HLC industry, such as state pollution control board and municipal entities (Pasupathi *et al.*, 2011).

The consultative Board shall take over the enforcement of the Rules in its respective state at the state level, under the leadership of the health minister, and shall advise any reforms. The Ministry of Health should co-opt members with experience in the area of BMDW management from other government and NGO's. The Advisory Board shall meet and review in the state all

matters concerning the application of the laws of the BMDW Management Rules and, at least once in six months (Shaida and Singla, 2019).

All persons who are exposed to toxic health care waste can be at risk, including people who work in health centres, who produce hazardous waste and others who work or are exposed to hazardous waste outside of these outlets (Padmanabham and Barik, 2019). The following are the main risk groupings-- MED physicians, assistants, MED care aids and health care staff; health care patients and others who receive care at home; visitors to MED centres; assistants for HLC facilities such as washrooms, waste transportation and storage; waste management staff, including workers at waste disposal sites; The risk associated with spreading, small sources of health waste should not be overlooked; waste produced by domestic health care, such as dialysis, and generated by illegal use of drugs, includes those derived from those source sites (Singh *et al.*, 2001).

The training curriculum is designed to increase management awareness and to provide MED personnel with appropriate job skills and consistent guidance on their respective positions. Around the same time a core training group for the auxiliary and sanitation workers could be organised in-house (Joseph *et al.*, 2015). To ensure success, training and guidance courses should be planned according to their qualifications and experiences, the role and responsibilities of these functionaries and employees as well as policy makers, civil authorities, the administration of HSP's, the MED Superintendents, deans and heads of departments, doctors, surgeons and experts (Hanumantharao, 2008). The training programme, in particular for the accompanying staff, should be repeated for different categories. Depending on available employee forces and resources, the interval between two programmes must be determined by the management (Mohandasundaram, 2003; Thind *et al.*, 2021).

Fig.1: Classification of BMDW.

HLC waste is an extremely difficult to handle heterogeneous blend. However, once a good management scheme is designed, the challenge can be streamlined and the scale minimised considerably (Fig. 2) (Onursal, 2003).

There is a steady increase worldwide in the number of people afflicted with COVID-19. It is extremely important in these situations to control waste, even dangerous, MED and household waste. Many additional forms of MED and dangerous wastes, including infection masks, apron, head mask, mouth mask, gloves, hypodermic needles, specimens and other protection equipment, drainage bags, urine bags, urine samples, tissue/cotton drenched in blood, hollow ampules

etc. are produced during the virus outbreak (Dargaville *et al.*, 2020; Ilyas *et al.*, 2020; Goswami *et al.*, 2021; Hantoko *et al.*, 2021; Thakur, 2021; Thind *et al.*, 2021). When combined, the MED waste and domestic waste will have a secondary effect on the health and climate of the population at large. Unwritten waste management might have unintended knocking consequences on the health of people and the environment and it is important, thus, that such waste be handled and disposed of appropriately (Kalina *et al.*, 2021). Following is the best practises used around the world:

China: A stringent management plan is in force to contain the dissemination of the virus in disposal of MED waste produced by COVID-19 patients.

Fig. 2: List of methods used for treatment and disposal of BMDW.

MED waste is rapidly disposed of in healthy areas to reduce infectious transmission. Fire-fighters are used to ensure rapid recycling in the designated locations where the Department of Environmental Protection secure disposes of waste (Rahman *et al.*, 2020; Singh *et al.*, 2020).

USA: The EPA has been rapidly releasing a 'temporary regulation' in the COVID-19 period for sectors producing hazardous waste. In order to facilitate identification and safe disposal for waste, the EPA put a specific emphasis on 'proper labelling'. In order to ensure that it is uninfected before final disposal, the relevant legislation requires separation of managed MED wastes from ordinary solid waste and special processes. In addition, under the United States Department of Labour, the Occupational Safety and Health

Management Guidelines advocate typical technical and managerial controls and safe work and personal safety clothing, such as penetrating-resistant gloves and facial and eye care, for the prevention of workers' radiation (Mihai, 2020; Klemeš *et al.*, 2020; Kulkarni and Anantharama, 2020).

France: In France, the government has agreed, with sorting orders to the residents, to ensure door-to-door waste recovery as normal. The hermetically sealed bag is used to dispose of mouth mask, gloves, apron and tissues, etc.) that are likely to present a risk of contamination for the environment and for the professionals responsible for their treatment. Any noxious wastes, cuttings or punctures must be stored by the specially assigned organisation in sealed containers

modified and managed. Self-handling patients will, upon prescription, get a waste disposal box from the pharmacy free of charge. The box must be closed until loaded and returned to a disposal point, after which the waste is disposed of properly (Belhadi *et al.*, 2020).

Germany: The German Government has given the safety and containment of COVID-19 to staff in waste management the top priority. Major steps were taken to handle waste from private households where COVID-19 cases are reported or suspected. Hand tooling's, tissues and related percentages of waste must be disposed of as residual waste and a minimal use of different waste disposal systems is recommended (e.g. paper container, organic bin, yellow bag). The waste was then stored in the waste incineration facilities in Bavaria to ensure controlled destruction up to 1000 °C at very high temperatures (Chartier, 2014).

India: India developed its own guidelines through the Central Pollution Control Board in India to ensure that BMDW produced in patients with COVID-19 is disposed of safely during care, diagnosis and quarantine. India was one of the first countries to proactively move in this direction (Ramteke and Sahu, 2020). The Guidelines of the Central Pollution Control Board include a set of measures for secure disposal of waste generated in isolation wards with patients COVID-19, COVID-19 sample recovery centres and laboratories and indoor and outdoor site camps. The recommendations further detail the responsibilities of Central Pollution Control Board, State Pollution Control Board and the Urban Local Government (Das *et al.*, 2021).

Along with Invest People of India and the "Mission for the waste to wealth" the Office has recently announced the COVID-19 BMDW Treatment Innovation Challenge to help the safe disposal and treatment of COVID-19-related BMDW is growing by the day and to facilitate more action and consider innovative solutions

(Silva *et al.*, 2020; Vaverková *et al.*, 2020).

Guidelines on the disposal of COVID-19-related biological waste have been provided by the WHO, including adequate waste segregation and the safeguarding of sanitation personnel. However, during the pandemic the sorting waste, segregation, shipping, temporary storage and waste treatment chain was disrupted. There is also no appropriate separation between dry and wet waste, and this affects the whole recycling chain. Sanitary staff seldom have adequate protective equipment's packs, soap and water, which are essential for the disease outbreak. Municipal agencies are often underpaid, even if work is outsourced to vendors, safety standards are scarcely enforced. Appropriate checks and balances are seldom kept for employees' protection (Kumar *et al.*, 2020; Behera, 2021).

Conclusion

The management of HSP's needs to consider the gravity of the problem and to distinguish between general and HSP waste. They must ensure the correct labelling, source isolation, storage in prescribed coloured bins; secure transport, adequate processing, and environmentally sound disposal of organic-MED waste. They can also provide health training for all those interested with BMDW collection and treatment. Finally, but not least, successful enforcement of the regulations is achieved by surprise visits and controls by the relevant authority and the determination of the responsibility of any individual involved in managing the BMDW. In the interests not only of the health care providers but also of the city, HSP Management must feel itself to be a significant concern in our environment and in the health of the nation.

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