ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at:www.ijdsir.com

Volume – 6, Issue – 6, November- 2023, Page No. :52 - 58

Hospital waste management- A public health perspective

[1]Akanksha Tiwari, BDS, Goregaon Dental Centre, India.

[2]Vidya Shankar Patil, BDS, MPH Drexel University, Pennsylvania, United States

[3]Harshvardhan Jain, BDS, Goregaon Dental Centre, India.

Corresponding Author: Akanksha Tiwari, BDS, Goregaon Dental Centre, India.

Citation of this Article: Akanksha Tiwari, Vidya Shankar Patil, Harshvardhan Jain,"Hospital waste management- A public health perspective", IJDSIR- November- 2023, Volume –6, Issue - 6, P. No.52– 58.

Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

Unregulated biomedical waste management (BMWM) is a public health problem. This has posed a grave threat to not only human health and safety but also to the environment for the current and future generations. Safe and reliable methods for handling of biomedical waste (BMW) are of paramount importance. Effective BMWM is not only a legal necessity but also a social responsibility. This article reviews the current perspectives on BMWM and rules, conventions and the treatment technologies used worldwide. BMWM should ideally be the subject of a national strategy with dedicated infrastructure, cradle-to-grave legislation, competent regulatory authority and trained personnel. Improving the management of biomedical waste begins with waste minimisation. These standards, norms and rules on BMWM in a country regulate the disposal of various categories of BMW to ensure the safety of the health-care workers, patients, public and environment. Furthermore, developing models for the monitoring of hospital health-care waste practices and research into non-burn eco-friendly sustainable technologies, recycling and polyvinyl chloride-free devices will go in long way for safe carbon environment. Globally, greater research in BMWM is warranted to understand its growing field of public health importance.

Keywords: Biomedical waste management rules 2016, biomedical waste, treatment technologies

Introduction

Expansion of health-care facilities as well as the recent trends of using plastic disposables and increase in medical and surgical interventions has led to unprecedented burden of biomedical waste (BMW). Unregulated BMW management (BMWM) has posed a grave threat not only to human health and safety but also to environment for the current and future generations.[1]

A prior study estimated that about half of world's population is at risk from hazards of improper BMWM either through impact at work in the environment or impact on public health. The public health threat due to improper BMWM has been reported worldwide.[2] Of note are the incidence of hepatitis B virus(HBV)

outbreak (240 infected) at Gujarat, India, in 2009 and infectious injuries to scavengers due to BMW generated in mass vaccinations (1.6 million) in Afghanistan.[3]

A nationwide survey performed by International Clinical Epidemiology Network in 25 districts across 20 states highlighted that only two big cities in India, Chennai and Mumbai, had comparatively better system for BMWM. Improper pretreatment of BMW at source and improper terminal disposal was the major challenges observed. It was observed that around 82% of primary, 60% of secondary and 54% of tertiary care health facilities were in the red category, i.e., the absence of a credible BMWM in place or ones requiring major improvement.[4] According to the studies conducted by the World Health Organization (WHO) in 22 developing countries showed that the proportion of health-care facility (HCF) that do not use proper waste disposal methods range from 18% to 64%.[5] In India, annually about 0.33 million tons of BMW is generated and rate ranges from 0.5 to 2.0 kg per bed per day.[6] The poor BMWM practices are attributed to lack of awareness and training as was concluded in a recent study.[7]

'Bio-medical waste' means any waste generated during diagnosis, treatment or immunization of human beings or animals. Management of healthcare waste is an integral part of infection control and hygiene programs in healthcare settings.[8] These settings are a major contributor to community-acquired infection, as they produce large amounts of biomedical waste. Biomedical waste can be categorized based on the risk of causing injury and/or infection during handling and disposal. Wastes targeted for precautions during handling and disposal include sharps (needles or scalpel blades), pathological wastes (anatomical body parts, microbiology cultures and blood samples) and infectious wastes (items contaminated with body fluids and discharges such as dressing, catheters and I.V. lines). Other wastes generated in healthcare settings include radioactive wastes, mercury containing instruments and polyvinyl chloride (PVC) plastics. These are among the most environmentally sensitive by-products of healthcare.[9] WHO stated that 85% of hospital wastes are actually non-hazardous, around 10% are infectious and around 5% are non-infectious but hazardous wastes. In the USA, about 15% of hospital waste is regulated as infectious waste. In India this could range from 15% to 35% depending on the total amount of waste generated.[10] The management of bio-medical waste is still in its infancy all over the world. There is a lot of confusion with the problems among the generators, operators, decision-makers and the general community about the safe management of bio-medical waste.[11] The reason may be a lack of awareness. Hence resource material on the environment for hospital administrators, surgeons, doctors, nurses, paramedical staff and waste retrievers, is the need of the hour.

Biomedical waste (BMW) is a major issue of concern in modern times.[12,13] As per WHO 15 -25% of the waste generated in the hospital is dangerous and hazardous to health as it poses a risk to health of individual. As per estimates 32% of new Hepatitis B infection, 40 % of Hepatitis C infections and 5 % of new HIV infections occur every year due to contaminated sharps and syringes.[15] Health care waste consists of solid, liquid and gaseous waste contaminated with organic and inorganic substance including pathogenic radionuclide generated from in vitro analysis of body microorganisms. Hospital waste possesses serious tissues and fluid. WHO (1999) reported that, about 85% of health hazard to the health workers, public and air hospital waste is non-hazardous, 10% infective and 5% flora on the area not infective but hazardous.[16] The Government of India (notification,

1998) specifies that Hospital Waste Management is a part of hospital hygiene and maintenance activities. This involves management of range of activities, which are mainly engineering functions, such as collection, transportation, operation or treatment of processing systems, and disposal of wastes.[17]

Need of biomedical waste management in hospitals

The reasons due to which there is great need of management of hospitals waste such as:[18-25]

1. Injuries from sharps leading to infection to all categories of hospital personnel and waste handler
2. Nosocomial infections in patients from poor infection control practices and poor waste management
3. Risk of infection outside hospital for waste handlers and scavengers and at time general public living in the vicinity of hospitals.
4. Risk associated with hazardous chemicals, drugs to persons handling wastes at all levels.
5. Disposable being repacked and sold by unscrupulous elements without even being washed.
6. Drugs which have been disposed of, being repacked and sold off to unsuspecting buyers.
7. Risk of air, water and soil pollution directly due to waste, or due to defective incineration emissions and ash

Benefits of Biomedical Waste Management

1. Cleaner and healthier surroundings.
2. Reduction in the incidence of hospital acquired and general infections.
3. Reduction in the cost of infection control within the hospital.
4. Reduction in the possibility of disease and death due to reuse and repackaging of infectious disposables.
5. Low incidence of community and occupational health hazards.
6. Reduction in the cost of waste management and generation of revenue through appropriate treatment and disposal of waste.
7. Improved image of the healthcare establishment and increase the quality of life.

Biomedical Waste Management Process

Mismanagement of hospital waste implies a combination of improper handling of waste during generation, collection, storage, transport and treatment.[8] Improper handling comprises several unsafe actions, such as handling without personal protective equipment (PPE), poor storage (e.g. high temperature conditions combined with prolonged storage times before treatment), manual transport for longer distances, use of uncovered containers instead of closed plastic bags, etc. Other examples include exposure times beyond acceptable limits, lack of worker and equipment decontamination procedures, etc., all of which affect hospital workers in different ways.[9] There is a big network of Health Care Institutions in India. The hospital waste like body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster casts from infected and contaminated areas are very essential to be properly collected, segregated, stored, transported, treated and disposed of in safe manner to prevent nosocomial or hospital acquired infection.[10]

Six steps of Bio medical waste Management

1. Waste collection
2. Segregation
3. Transportation and storage
4. Treatment & Disposal
5. Transport to final disposal site
6. Final disposal Safeguarding the health care workforce against occupational health risks arising from hospital-waste management calls for effective infectious waste control measures.

In addition to protecting workers health, such control measures protect public health and the environment from the hazards posed by hospital waste. Proper management ensures that infectious waste is handled in accordance with established and acceptable procedures from the time of generation through treatment of the waste and its ultimate disposal.

Classification and components of biomedical waste: The World Health Organization (WHO) has classified medical waste into eight categories such as General Waste, Pathological, Radioactive, Chemical, Infectious to potentially infectious waste, Sharps, Pharmaceuticals, Pressurized containers.[7]

Whereas, In India, Ministry of Environment and Forest, Government of India (1998) has notified Bio-medical Waste (Management & Handling) Rules -1998, which describes ten categories.[11]

Sources of generation of biomedical waste: Although the solid waste management has become one of the major topics of importance but still local bodies are unable to give the proper attention towards some special sources of wastes out of which biomedical waste is one. The sources of biomedical waste can be categorized as primary and secondary sources according to the quantities produced. While minor and scattered sources may produce some biomedical waste in categories similar to Bio medical waste, their composition will be different.[13]

Legislative aspect in relation to biomedical waste

Various central legislation related to biomedical waste management in India are as follows:[20]

- The water (prevention and control of pollution) Act, 1974
- The Air (prevention and control of pollution) Act, 1981
- The Environment (Protection) Act,1986
- The hazardous waste (management and handling) rules,1998
- The Biomedical waste (management and handling) rules,1998
- Municipal Solid waste (management and handling) rules, 2000
- The Biomedical waste (management and handling) rules Amendment ,2000 and 2003
- The Bio-medical Waste (Management and Handling) Rules, 2011. It may be kept in mind that any person can report any alleged negligence in Management and Handling of Bio-Medical Waste to the appropriate authority.

Biomedical waste handling, treatment and disposal methods

In India huge amount of medical facility are available which are producing the Biomedical waste such as body parts, organs, tissues, blood and body fluids along with soiled linen, cotton, bandage and plaster. This waste is very infected and contaminated.[10] It is very essential to properly collect, segregate, store, transport, treat and dispose this waste in safe manner. Incineration of biomedical waste is one of the most commonly adopted methods of treatment in India because of its low cost but Incineration causes bad environmental effects. Other than incineration the methods such as autoclave treatment, microwave treatment, dielectric heating, Depolymerization, Pyrolysis-Oxidation, etc are used in some places in India.[11]

Suggestions

The following solutions to remove obstacles to make progress in hospital waste management are recommended:

1. Calculate and monitor economical benefits from waste minimization in hospital.

2. More accurate monitoring and controlling of hospital waste separation process by the ministry of health and medical education and environmental protection agency.

3. Materials management in a way that the 3 primary criteria of using less, reusing and recycling to be considered.

4. Review reasonably related laws to facilitate the process of reducing the danger of hospital waste and removing their problems.

5. Review the laws in the process of the hospital waste separation at source and related definitions to prevent from confusion of officials responsible for hospital waste separation.

6. Participation of private sector's specialists in the process of hospital waste management.

7. Domestic and foreign investment to import modern technology in the country by public and private sector.

8. Meetings with managers and officials for a closer relationship and familiarity with available scientific and practical solutions.

9. Helping of the University to improve the implementation of the plans and suggests new scientific recommendations.

10. Advertising extensively by the public media for more awareness of the public.

11. Using new technology capable of reducing waste in different parts of the hospital, especially areas with potential of production of hazardous wastes

Future Recommendations

Training programs need to focus on empowering the healthcare professionals on biomedical waste management with broad scope and practical knowledge in all aspects. Training the staff with checklists and regular inspections can bring about accountability in the staff. Improper Biomedical waste management leads to environmental pollution, multiplication of vectors like insects, rodents & worms leading to transmission of diseases like typhoid, cholera, plague, hepatitis & AIDS. Recycling of disposable syringes, needles, intravenous sets, and glass bottles without proper sterilization leads to hepatitis, tetanus, HIV & viral diseases. Benefits of biomedical waste management include healthy surroundings, reduction in hospital acquired infections & cost of infection control, reduction in reuse of infectious disposables & prevention of occupational health hazards. Awareness about hazards of biomedical waste & its proper disposal is required for a safe & healthy future. All health care professionals regardless of their designation, experience and qualification, designation must be included in these interventions, so that it can avoid cross infections among the professionals and patients in the health care sector.

Conclusion

The present study concludes that Bio medical waste is one of the most hazardous waste generated by human beings. Management of the bio medical waste is becoming a challenging issue in India. Governmental and non-governmental agencies have recognized the biomedical waste management as matter of concern. More and more studies must be conducted in qualitative as well as quantitative access for bio medical waste so that the proper management of bio medical waste take place. Proper methods of treatment of bio medical waste needs to be developed for health and environmental safety.

BMWM should be a shared teamwork with committed government backing, good BMW practices followed by both health-care workers and HCFs, continuous monitoring of BMW practices, and strong legislature. It is our fundamental right to live in clean and safe environment. The pillar of BMWM is segregation of waste at source and WR. The current BMWM 2016 rules

are an improvement over earlier rules in terms of improved segregation, transportation, and disposal methods, to decrease environmental pollution and ensure the safety of the staff, patients, and public. Moreover, more use of non-PVC medical devices and development of newer novel, eco-friendly systems for disposal of BMW should be encouraged. All participants in BMWM should pledge to guarantee a cleaner and greener environment.

References

1. Chartier Y, Emmanuel J, Pieper U, Pruss A, Rushbrook P, Stringer R, editors. Safe Management of Wastes from Health-Care Activities. 2nd ed. Geneva, Switzerland: WHO Press; 2014. p. 1-146.
2. Li CS, Jenq FT. Physical and chemical composition of hospital waste. Infect Control Hosp Epidemiol. 1993;14:145-50.
3. WHO. Review of Health Impacts from Microbiological Hazards in Health-Care Wastes. Geneva: World Health Organization; 2004.
4. Secretariat of the Basel Convention. Technical Guidelines on Environmentally Sound Management of Wastes Consisting of Elemental Mercury and Wastes Containing or Contaminated with Mercury 31 October, 2011. Geneva: Basel Convention and United Nations Environment Programme; 2011.
5. Secretariat of the Stockholm Convention. Revised Draft Guidelines on Best Available Techniques and Provisional Guidance on Best Environmental Practices of the Stockholm Convention on Persistent Organic Pollutants. Geneva: Secretariat of the Stockholm Convention; 2006.
6. David Lennett, Richard Gutierrez. Countries: List of signatories. In: Minamata Convention on Mercury. Geneva: United Nations Environment Programme; 2014.
7. Walkinshaw E. Medical waste-management practices vary across Canada. CMAJ 2011;183:E1307-8.
8. Ministry of Environment and Forests Notification. Bio-Medical Waste (Management and Handling, 1998) Rules. New Delhi: Government of India Publications; 1998. p. 276-84.
9. INCLEN Program Evaluation Network (IPEN) Study Group, New Delhi, India. Bio-medical waste management: Situational analysis & predictors of performances in 25 districts across 20 Indian states. Indian J Med Res 2014;139:141-53.
10. Seetharam S. Hepatitis B outbreak in Gujarat: A wake-up call. Indian J Med Ethics 2009;6:120-1.
11. The Gazette of India Biomedical Wastes(Management and Handling) Rules, India: Ministry of Environment and Forests, Government of India. Notification Dated; 20th July, 1998.
12. Bio-Medical Waste Management Rules, 2016. Published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-Section (i), Government of India Ministry of Environment, Forest and Climate Change. Notification; New Delhi, the 28th March, 2016.
13. Mattiello A, Chiodini P, Bianco E, Forgione N, Flammia I, Gallo C, et al. Health effects associated with the disposal of solid waste in landfills and incinerators in populations living in surrounding areas: A systematic review. Int J Public Health 2013;58:725-35.
14. Vilavert L, Nadal M, Schuhmacher M, Domingo JL. Two decades of environmental surveillance in the vicinity of a waste incinerator: Human health risks associated with metals and PCDD/Fs. Arch Environ ContamToxicol 2015;69:241-53.

15. Subramanian A, Ohtake M, Kunisue T, Tanabe S. High levels of organochlorines in mothers' milk from Chennai (Madras) city, India. Chemosphere 2007;68:928-39.
16. Emmanuel J. Non-Incineration Medical Waste Treatment Technologies. Washington, DC: Health Care without Harm; 2001.
17. Nema SK, Ganeshprasad KS. Plasma pyrolysis for medical waste. Curr Sci 2002;83:271-8.
18. Roohi, Bano K, Kuddus M, Zaheer MR, Zia Q, Khan MF, et al. Microbial enzymatic degradation of biodegradable plastics. Curr Pharm Biotechnol 2017;18:429-40.
19. Chartier Y, Emmanuel J, Pieper U, Prüss A, Rushbrook P, Stringer R, editors. Safe Management of Wastes from Health-Care Activities. 2nd ed. Geneva, Switzerland: WHO Press; 2014. 1-146.
20. Tiwari A, Kadu P. Biomedical Waste Management Practices in India-A Review. Int J Curr Eng Technol. 2013;3(1\5):2030–3.
21. Narang RS, Manchanda A, Singh S, Verma N, Padda S. Awareness of Biomedical Waste Management Among Dental Professionals and Auxiliary Staff in Amritsar , India. OHDM. 2012;11(4):162–9.
22. ORGANIZATION WH. Safe health-care waste management. 2004.
23. WHO. (1999). Guidelines for safe disposal of unwanted pharmaceuticals in and after emergencies. Essential drugs and other Medicines Department. World Health Organization, Geneva, Switzerland.180.
24. Govt. of India, Ministry of Environment and Forests Gazette notification No 460 dated July 27, New Delhi: 1998: 10-20.
25. Hem Chandra, Hospital Waste an Environmental Hazard and Its Management, (1999) 9. Bio Medical Waste Management Rules, 2016. Published in the Gazette of India, Extraordinary, Part II, Section 3, Sub Section (i), Government of India Ministry of Environment, Forest and Climate Change. Notification; New Delhi, the 28th March, 2016.