IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 23, Issue 8 Ser. 7 (August. 2024), PP 30-34
www.iosrjournals.org

Challenges In Biomedical Waste Management In Oral Pathology Laboratory

Jaswant Singh[1], Akshay Bharagava[2], Krishna Sireesha Sundaragiri[3], Shikha Saxena[3], Bharat Sankhla[3], Meenakshi[4], Ghata Savoriya[4], Reena Pabri[5], Kriti Agarwal[1]

1Post Graduate, Department Of Oral Pathology RUHS College Of Dental Sciences (Govt. Dental College) Jaipur, Rajasthan, India
2Professor And Head Of Dept., Department Of Oral Pathology RUHS College Of Dental Sciences (Govt. Dental College) Jaipur, Rajasthan, India
3Professor, Department Of Oral Pathology RUHS College Of Dental Sciences (Govt. Dental College) Jaipur, Rajasthan, India
4Assistant Professor, Department Of Oral Pathology RUHS College Of Dental Sciences (Govt. Dental College) Jaipur, Rajasthan, India
5 Senior Demonstrator , Department Of Oral Pathology RUHS College Of Dental Sciences (Govt. Dental College) Jaipur, Rajasthan, India

Abstract
In recent years biomedical waste has become a global problem. Hospitals, health clinics, nursing homes, medical research laboratories, offices of physicians, dentists, and veterinarians, home health care, and funeral homes are among the facilities that frequently produce biomedical waste. To safeguard the general public, particularly healthcare and sanitation personnel who frequently handle biomedical waste as part of their jobs, it needs to be appropriately managed. The biomedical waste generated in the laboratory of oral pathology and microbiology include a variety of items, including human tissues, different bodily fluids, culture medium, chemicals, lab slides, eyewear, scalpels, blades, and needles. They are segregated according to colour code. The aim of this review is to sensitize and increase awareness among oral pathologists as well as the technical staff working in the oral histopathology laboratories about various biomedical waste products and their management.

Keywords- *Biomedical waste, oral pathology laboratory, colour code*

Date of Submission: 15-08-2024 Date of Acceptance: 25-08-2024

I. Introduction

According to Bio medical waste (BMW) management and handling rules 1998 of India-Biomedical waste is defined as any waste ,which is generated during the diagnosis, treatment and immunization of human beings or animals or in research activities pertaining there to or in the production and testing of biological products[1].

Compared to other waste kinds, the waste generated during health care activities has a higher risk of infection and harm.**,** thus having a trustworthy and safe way to handle is crucial. Improper and inadequate handling of BMW could have a major negative influence on the environment and public health[2]

Thus, proper BMW management is essential to protect the environment's health and need to be a standard component of medical care[3]. Hence BMW handling training at different levels is necessary. With this objective we are reviewing the sources of BMW , standard steps for BMW management including categorization, segregation, storage, transport and disposal in the oral pathology laboratory. A note on method of final disposal has also been reviewed in this article.

Sources Of Biomedical Waste

Hospitals produce waste, which is increasing over the years in its amount and type **specially after Covid-19.** The hospital waste not only puts patients and staff at risk, but it also endangers the environment and public health [4].

Oral pathology is composite and compact of various branches – pathology, microbiology, forensic odontology. Therefore, various types of BMW are generated in oral pathology laboratory. These are the following source of BMW :

Major sources[5]**:**
- Govt. hospitals/ Private hospitals/Nursing homes/Dispensaries
- Primary health centers
- Medical colleges and research centers/Paramedic services
- Dental college/Oral pathology laboratory
- Veterinary colleges and animal research centers
- Blood banks/Mortuaries/Autopsy centers
- Biotechnology institutions
- Production units

Minor sources:
- Physicians/Dentist clinics
- Animal houses/Slaughter houses
- Blood donation camps
- Vaccination centers
- Acupuncturists/Psychiatric clinics/Cosmetic piercing
- Funeral service
- Institutions for disabled persons

Bio- Medical Waste Management & Handling Rules

Bio-medical Waste (Management & Handling) Rules, 1998 under the Environment (Protection) Act, 1986 and these rules are further amended in the year 2000 and 2003. In supersession of the Bio-medical Waste (Management & Handling) Rules, 1998, Government of India (GOI) has notified the revamped Bio-medical Waste Management Rules, 2016 which came into force from 28.03.2016[6].

Management Of Bio-Medical Waste

Oral pathologist, lab and other staff should be familiar about all steps of biomedical waste management so as to avoid any possible hazard to human health and environment. Collection and transport are the two operations where the chances of segregated BMW coming in contact with public, rag pickers, animals/birds, etc are high. Therefore, all care shall be taken to ensure that the segregated BMW handed over by the healthcare units, reach treatment facility without any damage, spillage or unauthorized access by public, animals etc.

Biomedical waste generated
↓
Categorize it
↓
Segregation at point of generation & collection
↓
In house transportation & Temporary storage at HCF
↓
Offsite transportation to CBWTF designated vehicle & unloading and temporary storage
↓
Pretreatment & final disposal

[Flowchart : showing various steps in BMW management]

Standard Steps[7]

In waste management, the following standard steps that are required to be followed will be discussed under each category of waste.

A. Categorization
B. Segregation
C. Storage and transport
D. Disposal

BMW Training at all 4 steps oral pathology department of doctors, residents, lab technician, lab assistant to every level of personals like peon, sweepers, auxillary workers like plumbers, BMW handlers should be conducted.

A: Categories of biomedical waste

There are a total of ten categories mentioned in The Government of India, "Biomedical Waste (Management and Handling) rules" 1998[8]

Table 1: Categories of biomedical waste, their segregation and disposal [9]

Category no.	Waste category	Example	Treatment and disposal
1	Human anatomical waste	Human tissues, organs, body parts	Incineration*/deep burial
2	Animal waste	Animal tissue, experimental animal	Incineration*/deep burial
3	Microbiology and biotechnology waste	Laboratory cultures, toxins	Local autoclaving/ microwaving/incineration
4	Waste sharp	Needles, syringes, scalpels	Disinfection(chemical treatment @/autoclaving/microwaving and mutilation shredding)
5	Discarded medicine and cytotoxic drugs	Outdated, contaminated and discarded medicine	Incineration@ destruction and drugs disposal in secured landfills
6	Soiled waste (items contaminated with blood)	Items contaminated with blood and fluids including cotton, dressing	Incineration@ autoclaving
7	Solid waste (disposal items) Solid waste (disposal items)	Disposable items other than waste sharps such as tubings, catheters	Disinfection by chemical treatment@@ autoclaving/microwaving and mutilation/shredding ##
8	Liquid waste	Waste generated from laboratory and washing,cleaning	Disinfection by chemical treatment @@ discharge into drains
9	Incinerated ash	Ash from incineration of any bio medical waste	Disposal in municipal landfill
10	Chemical waste	Chemical used in production of biological,chemicals used in disinfection	Chemical treatment @@ and discharge into drains for liquids and secured landfill for solids

@@ Chemical treatment using atlest 1% hypochoride solution or any other equipment chemical reagent. It must be ensured that chemical treatment ensures disinfection.
Mutation / shredding must be such so as to prevent unauthorized reuse.
@ There will be no chemical pretreatment before incineration. Chlorinated plastics shall not be incinerated.
* Deep burial shall be an option available only in towns with population less than five lakhs and in rural areas.
Biomedical Waste of Concern in oral pathology laboratory:
Oral pathologist work in different clinical set up eg.
1. Private clinic
2. Dental college
3. Medical college/district hospital/Community health center/ Primary health center

They are classified as follows
1. Chemical waste eg. formaldehyde, ethanol, xylene, hemaxollin, eosin
2. Infectious waste eg. culture media, blood contaminated gauze
3. Pathological waste eg. surgical biopsies, human tissue
4. Sharps eg. needles, scalpels, blade
5. Pharmaceutical waste eg. cytotoxic drugs
6. Non-hazardous general waste

B: Segregation according to colour code

Figure 1: Colour coded picture of segregation of BMW [BMW handling rule –2016]

Waste segregation should happen at the point of generation to minimization and effective management i.e. the laboratory collection centres**.** To improve segregation efficiency proper placement, labeling of colour coded bins and use of colour coded bags with bar codes, as per BMWM Rules, 2016**[10]** must be strictly implemented.

C. Storage and transport:

As per BMW Management Rules, 2016, it is the duty of the occupier to make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste in coloured bags or containers in the manner as specified in Schedule[12]. A separate designated space to be allocated within the health care facility for storing of waste collected from different waste generation points in the health care facility till disposal to common biomedical waste treatment facility or onsite treatment[12]. Wheeled trolleys, containers or carts used for transportation that are not used for any other purpose, cleaned daily, marked with the name and address of carrier, biohazard symbol should be painted and suitable system for securing the load during transport should be ensured. The BMW handling personal need to be trained and monitored on regular basis that be followed in the oral pathology laboratory.

D. Disposal

Different Methods Of Onsite Disinfection suggested As Per BMWM Rules – 2016[10 & 12]

1. Autoclave
2. Microwave
3. Chemical disinfection with sodium hypochlorite solution

1. Autoclaving [13]

The basic principle of sterilization is that steam under pressure and required temperature is microbicidal and sporicidal. The four parameters that are important for autoclave are steam, pressure, temperature and time. Items that can be autoclaved: soiled waste, left over samples in the laboratory, any waste contaminated with blood or body fluids (gauge,bandages,linen,), sharps, microbiological waste like culture media, limited amount of fluids[12].

2. Microwaving [13]

Moist heat and steam are generated by microwave energy and microwaving is essentially a steam based process.Items which can be disinfected using microwave: Cultures and stocks, sharps, materials contaminated with blood and body fluids, isolation and laboratory waste (excluding chemical waste) and soft waste (e.g. gauze, bandages, gowns and bedding) from patient care.Items not to be put in microwave: Volatile and semi- volatile organic compounds, chemotherapeutic waste, mercury, other hazardous chemical waste and radiological waste[12].

3. Chemical disinfection with Sodium hypochlorite solution [13]

Active against most bacteria, viruses and spores; widely used for treatment of waste water. Chemical disinfection is most suitable for treating liquid waste such as blood, urine, stools or hospital sewage [12] .

Methods Of Final Disposal

1. Incineration

Incineration is an important technology for the treatment and decontamination of medical waste, involving high-temperature (800˚C to 950˚C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter with a significant reduction of waste volume and weight. [14].

2. Mechanical treatment

Mechanical treatment processes include shredding, grinding, mixing and compaction technologies that reduces waste mass, although they cannot destroy pathogens. It helps in prevention of reuse of BMW[12].

3. Sharp Pit/Encapsulation

Sharp pit or a facility for sharp encapsulation in a metal container or cement concrete shall be provided for treated sharps (i.e. treatment by autoclaving or dry heat sterilization followed by shredding or mutilation [15].

4. Effluent Treatment Plant:

Waste water from health care facilities must be treated before discharge into themunicipal sewerage system [12].

Ludhiana Model – Hypotreat

'HYPOTREAT'™ is a device for Pre-Treatment of liquid medical waste at the source itself. It is a registered product of Paryavaran Solutions Ludhiana vide design registration No. 270902 Dated 1.4.15, Patent office, Govt of India, New Delhi. It is a continuous flowbaffled reactor which ensures effective contact of liquid waste with disinfectant (10%NaOCl) for sufficient interval of time (HRT designed for min 1hr to 5hrs depending upon quantity of waste produced) so as to automatically drain it under gravity without any manual intervention[12].

Figure 2: Ludhiana model – Hypotreat [16]

Handling of commonly used Chemical waste [12]

Oral pathologist and other staff should be aware about commonly used chemical waste handling and their disposal methods.eg.

I - Formaldehyde
II- Ethanol (Ethyl alcohol)
III- Xylene
IV- Other commonly used chemicals in the histopathology laboratory

Table 2: Various chemical and their disposal method used in oral pathology laboratory

Chemical	Disposal Method
Formaldehyde[17]	Dilution & neutralization
Ethanol (Ethyl alcohol)[18]	Onsite recycling by fractional distillation
Xylene[19]	Controlled incineration or Onsite recycling by fractional distillation
Haematoxylin	burn in a chemical incinerator
Eosin	Nonrecyclable solutions to a licensed disposal company.
Chemicals containing heavy metals	Chemical precipitation (metal recovery)
Strong acids and alkalis	treated as hazardous waste – give to licensed disposal company
Disinfectants	Recycling is preferred. Disposal in compliance with local regulations or incineration.

II. Conclusion

As healthcare practitioners, we as oral pathologist should be concerned about promoting not just human health along with well-being, but also that of the environment. Biomedical Waste management programs cannot be a success in the absence of the required devotion, self-motivation, willingness, cooperation and participation of all the employees of health care sectors. Oral pathologist need to be educated via educational programs regarding the correct waste disposal methods to improve their practical abilities in the oral pathology laboratory. A holistic approach will definitely help our profession to triumph in today's world of increased public environmental concern and protective litigation.