

# Dental Biomedical Waste Management

Harender Singh<sup>1</sup>,  
DJ Bhaskar<sup>2</sup>,  
Deepak R Dalaj<sup>3</sup>,  
Rahila Rehman<sup>4</sup>,  
Mohsin Khan<sup>5</sup>

<sup>1</sup>2<sup>nd</sup> Year Post Graduate Student, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College, Moradabad, U.P, India, <sup>2</sup>MDS, MPH, Professor & Head, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College, Moradabad, U.P, India, <sup>3</sup>2<sup>nd</sup> Year Post Graduate Student, Department of Public Health Dentistry, Teerthanker Mahaveer Dental College, Moradabad, U.P, India, <sup>4</sup>M.Phil (Psychology) & Education & Guidance counsellor, Ghaziabad, U.P, India, <sup>5</sup>2<sup>nd</sup> Year Post Graduate Student, Department of prosthodontics, Teerthanker Mahaveer Dental College, Moradabad, U.P, India

**Corresponding Author:** Dr. Harender Singh, Dept. of Public Health Dentistry, Teerthanker Mahaveer Dental College, Moradabad, U.P. E-mail: h.chokar@gmail.com

## Abstract

This review provides information to dentist and dental staff that, they need to properly manage Dental waste and render suggestions for managing the wastes from the day-to-day activities in Dental practises, such as: Amalgam waste, mercury, used cleaners for X-ray developer systems, X-ray fixers and developers; shields and aprons, lead foils; chemical sterilant solutions; cleaners, disinfectants and other chemicals; and general medical waste. Dental healthcare staff should be aware of the proper handling and the management of dental waste. A lot of biomedical waste (BMW) is generated in dental practices that can be harmful to the environment and to those who come in contact with the materials, if not dealt with appropriately. Most of the rules all over the world are not specific for dental BMW management and impede natural understanding by dental practitioners, due to lack of clear cut guidelines either from Government of India or Indian Dental Association (IDA) or Dental Council of India on disposal of dental wastes. To prevent the harmful effects on health and the environment it is required to follow proper segregation protocol. The simplified system provided a good model to be followed in developing countries like India and improved understanding among dental practitioners and dental staff, due to its self-explanatory nature.

**Keywords:** Biomedical waste, Dental, Waste management

## INTRODUCTION

Definition of biomedical waste “Any solid, fluid or liquid waste, including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biological and the animal waste from slaughter houses or any other like establishments (Bio-medical waste rules 1998 of India).<sup>1</sup> Dental practices produce large amounts of waste such as plastic, latex, cotton, glass and other materials, most of them can be contaminated with infected body fluids. Dental practices also produce tiny amount of other types of waste, such as silver amalgam, mercury and various chemical solvents. The dentist generate only 3% of total medical waste estimated by US medical waste tracking system.<sup>2</sup> The quantity of waste generated is equally important. A lesser amount of biomedical waste means a lower burden on waste disposal work, a more efficacious waste disposal system and cost-saving.<sup>3</sup>

## Categories of Waste Generated in Dental Practises<sup>4</sup>

- Biomedical waste- Non anatomic waste & Anatomic waste, sharps.
- Silver containing waste-used fixer solution and unused x-ray films.
- Lead containing wastes-lead aprons and lead foils inside the x-ray films.
- Mercury containing wastes-element mercury, scrap amalgam.
- Chemicals, disinfectants and sterilizing agents.

## Steps in Waste Management<sup>5</sup>

1. Waste survey: Quantification and differentiation of waste.
2. Waste segregation: Placing different wastes in different containers.
3. Waste accumulation and storage: Accumulation temporary holding and storage longer holding.
4. Waste transportation: Wastes are carried in special containers in vehicles.

5. Waste treatment: A process that modified the waste to disinfect or decontaminate the waste so that they are no longer a source of pathogens and can be handled, transported and stored safely.
6. Waste disposal: Incineration, microwave irradiation, chemical disinfects, wet and dry thermal treatment, inertization and land disposal.
7. Waste minimization: Following reduce, reuse and recycle methods.

### Waste Disposal by Waste Management Practises Anatomic and Non-Anatomic Waste

Non-Anatomic waste: When gauze is soaked in blood and blood is dripping, it becomes a hazardous waste. Its can be completely manage by collect the non-anatomical wastes in yellow biomedical waste bag, apply double bag for the waste, by labeling a biohazard symbol with the bag, keep in refrigerator if onsite for more than four days, Once waste is collected, inform to certified biomedical waste carrier for disposal and soaked cotton and gauzes should not be thrown into the regular garbage.<sup>1</sup>

Anatomic waste: excised tissues, organs, tumors, extracted teeth. Separate the material from other wastes and use a yellow biomedical waste bag to collect the anatomic waste. Double bag the waste and labeled with a bio-hazard symbol and fill the bag till  $\frac{3}{4}$  level and tie it tightly and contact a certified waste carrier for disposal.<sup>5</sup>

### Mercury Containing Waste

Dental Amalgam particles are a source of mercury which is known to be a neurotoxic, nephrotoxic, and bio-accumulative element. It can get into the environment through wastewater, scrap amalgam or vapours. Vaporous mercury waste management includes:

- (1) Stored unused elemental mercury in a sealed containers,
- (2) Contact to a certified biomedical waste carrier (CWC) for disposal and recycling,
- (3) Use a “mercury spill kit” in case of a spill of mercury,
- (4) Unused elemental mercury reacts with silver alloy to form scrap amalgam,
- (5) Not placing elemental mercury in the garbage, and
- (6) Don't wash elemental mercury in the drain. Scrap amalgam waste management implicates
  - Using suction traps and disposable amalgam separators on dental suction units, to prevent amalgam accumulation the trap should be changed weekly,
  - Required amalgam amount only mixed or use premeasured amalgam capsules,
  - Do not though extracted teeth filled with amalgam in the regular garbage,
  - Use mercury containers to stored all scrap/old amalgam.<sup>6,7</sup>

### Scrap Amalgam

For the management of scrap amalgam,

- Mercontainer™ (Sponge type) are appropriate to store the scrap amalgam. Empty amalgam capsules can be disposed in the garbage due to non-hazardous in nature.
- Using an ISO 11143 compliant amalgam separator on the suction lines is suitable for removing over 95% of the contact amalgam before diffusing in the sewer system.
- Disposable suction traps on your dental units should be changed weekly. Always use gloves, mask, and glasses while cleaning the suction traps. Disposable trap should be placed into a properly labelled container of Merconvap™ solution for proper disposal. After filling it, a certified waste carrier should be contacted for recycling or disposal of it.

Properly labelled container with mercury vapour suppressant such as fixer or Merconvap™ solution are suitable to submerse the amalgam particles. The container must be labelled “Hazardous Waste: Scrap Amalgam”. Premeasured capsules mixed only as much amalgam as is immediately required. Large pieces of amalgam should be removed manually which are produced, when removing old fillings and store them in a contact amalgam container. Appropriate use of amalgam substitutes can be considered.

### Amalgam separation

Sedimentation units are one of the basic types of amalgam separation technologies which decrease the speed of the flux of water with baffles or tanks to allow amalgam particles to settle. The water out to the sides of the unit is spin by Centrifuge units. These units offer good amalgam removal but cause some foaming with American vacuum systems. Ion Exchange units use polymers to capture small particles; these are often used in series with sedimentation units. Other wastewater treatment technologies such as electrolysis and chemical additions have been adapted for dental applications.<sup>3</sup>

### Silver Containing Wastes

Spent X-ray fixer used in dental clinics to develop X-rays is a hazardous material that should not be easily rinsed in the drain. The fixer with a recovery unit can be mixed with water and developer and disposed down the septic system or sewer after desilvering. Spent developer is permitted to be discharged in the above systems after dilution with water. The silver should be handed over to the CWC. Using a digital X-ray system and without chromium X-ray cleaner are another suggested safety measures.

Undeveloped X-ray films include a high level of silver and must be treated as hazardous waste. It is advisable to accumulate any unused film that needs disposing in an approved container for recycling by the disposal company. New X-ray films purchase can be minimized by using a digital x-ray unit.<sup>8</sup>

### Lead-Containing Wastes

The lead foil inside X-ray packets and lead aprons contain toxin that can result into defilement of soil and groundwater in landfill areas after disposal.

They should only be handed over to CWC. Excessive doses of lead intake begin to reproductive, neurotoxicity, toxicity, carcinogenicity, hypertension, renal function, immunology, toxicokinetics etc.<sup>9</sup>

### Sharps

Needles, glass, syringes, ortho wires, sharp instruments, files.

- The sharp wastes should be handled with care.
- Needles should be mutilated by needle destroyer/cutter, before disposing off syringes.
- Non-mutilated syringes are kept in blue bags, will result in prick injury, puncture of the bags and spillage of the waste.

### Mutilation

Mutilation should be strictly practiced, it is recommended for disposable needles and other sharp wastes. Mutilated needles and other sharp wastes may be kept in puncture proof containers with 1% Sodium Hypochlorite solution for primary disinfection and after every 2 days the solution should be changed.<sup>10</sup>

### Chemicals, Disinfectants, and Sterilizing Agents

Staff should be trained in Workplace Hazardous Materials Information System (WHMIS) for the handling of materials. Steam or dry heat can be use to sterilize dental instruments, whenever it's possible. Non-chlorinated plastic containers (not PVC) should be preferred to decrease environmental impacts and placed in the solid waste stream. Halogenated sterilants have a detrimental effect on environment. Ignitable sterilants should not be poured down the drain as they have potency to explode. HCHO sterilants should also not be disposed down a drain. Directly pouring of sterilant into a septic system may significantly disrupt the bacteria which normally breakdown wastes.<sup>11</sup>

## CONCLUSION

Bio-Medical Waste management programme cannot successfully be implemented without the devotion, self motivation, willingness, cooperation and participation of all sections of employees of any health care establishment. Therefore, it becomes the responsibility of this group to segregate and manage the waste in such a way that it is no longer hazard for them, public and environment. Desired attention is needed regarding the proper disposal of dental waste to rescue the immediate environmental foul, and to ensure the safety of those who come into contact with it. It is time that the dental education give due importance to this vital issue. So the academic institutions and non-governmental organisations could also play an active role in disseminating information. Keeping in view, incorrect management of biomedical wastes, the Ministry of Environment and Forests notified the "Bio Medical Waste (Management and Handling) Rules 1998." These rules are meant to protect the society, patients and health care workers. Develop a system and culture through training, education and persistent motivation of the dental practitioners and dental staff is most imperative component of the waste management plans.

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