

# Biomedical Waste Management in Dental Clinics-A Review

Anju Dhar<sup>#1</sup>, Gokul Sridharan <sup>\*2</sup>

<sup>#1</sup> Reader Department of Microbiology, YMT Dental College & Hospital, Kharghar, Navi Mumbai, India

<sup>#2</sup> Reader Department of Oral Pathology & Microbiology, YMT Dental College & Hospital, Kharghar, Navi Mumbai, India

## Abstract

Biomedical waste management is one of the emerging cause for Hospital Acquired Infection, which is very important to deal with as it poses very significant impact on the health and environment. Dental Hospitals like other medical set ups also generate biomedical waste which is hazardous to the health of community, health care workers/clinicians and environment if not properly managed. This includes sharps, used disposable items, infectious waste, mercury containing waste, lead containing waste and chemical waste. This review article intends to create awareness in dental hospital and guide for the proper management of biomedical waste generated in the hospitals.

## I. INTRODUCTION

According to Biomedical Waste (Management and Handling) Rules, 1998 of India, "Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals [1]

Categories of Biomedical waste:-

- Category No-1-Human Anatomical Waste.
- Category No-2- Animal waste
- Category No-3-Microbiology and Biotechnology waste.
- Category No-4- Waste Sharps
- Category No-5-Discarded Medicine, Cytotoxic drugs.
- Category No-6 - Soiled waste
- Category No-7 -Solid waste
- Category No-8 -Liquid waste
- Category No-9 -Incineration Ash
- Category No-10-Chemical waste.

## II. TYPES OF DENTAL WASTE

Dental Amalgam Waste includes Amalgam traps, Bulk Mercury, Contact Amalgam (i.e. Extracted teeth containing Amalgam). It also contains other scrap heavy metals such as Lead foils, XRAY processing Wastes which includes Silver containing Wastes present in X ray photographic fixer and chromium is also present in X-ray developer ray system cleaners. Dental waste also comprises of

Chemical disinfectants and sterilizing Agents, Medical Waste, Sharps waste and other Biohazardous waste. [2]

## III. ENVIRONMENTAL HAZARDS ASSOCIATED WITH DENTAL WASTE

### A. Dental Amalgam

It is a mixture of Mercury, Silver, tin and copper. It is known to be Neurotoxic, Nephrotoxic and bio cumulative element. Mercury which makes up the 50% of the compound is used to bind the metals together and to provide strong, hard, durable filling. High exposure to Mercury can cause biological and neurological damage. Dental mercury enters the environment through many different pathways like air, water and land. It enters in Air through human cremation, sewage sludge and waste incineration and dental clinic emissions. It enters water through human waste disposal and dental clinic release. It enters Land through landfills, human burials and fertilizers. It affects the occupants in the institution and spread in the vicinity and institutions [3]. Its exposure may aggravate Kidney disorders, chronic respiratory diseases and nervous system disorders. It may cause damage to blood, liver, brain, peripheral nervous system, central nervous system. During the placement and removal of dental amalgam, restorations a variety of waste product is generated like Elemental mercury vapor released from dental amalgam alloy, Dental amalgam scrap, Amalgam waste and Amalgam sludge. It should be disposed properly according to BMC guidelines. [3]

### B. Silver

Another heavy metal can cause health hazard if not properly disposed and if it enters into water system. Used X-ray fixer contains silver. Silver concentrations in used fixer solutions generally range from 8 to 12 g/Silver in used fixer solutions is in the form of silver thiosulphate complexes, which are extremely stable and have very low dissociation constants. Wastewater treatment processes convert the silver thiosulphate into mostly silver sulfide, which settles in sludge and is toxic to aquatic life [4].

### C. Lead

Lead like mercury and silver is also biohazardous and can cause neurotoxicity, carcinogenicity, hypertension, renal dysfunction and

other immunological effects. The lead foil inside X-ray packets and lead aprons contain toxin can result into defilement of soil and groundwater in landfill after its disposal [4].

#### **D. X ray**

X-Ray developer contains a chemical known as hydroquinone, which is highly toxic substance. It is skin irritant and when exposed improperly persons can develop symptoms like dizziness, headache, nausea, vomiting, lack of oxygen in blood and any dust that gets in the eyes can lead to impaired vision [5].

#### **E. Sharps**

Sharps are needles, scalpels, glass, burs, acid, files, blades and other sharp object. These sharps if not disposed in puncture proof containers can cause cuts to solid waste handlers, which can cause infection [6].

#### **F. Chemical, Disinfectants and Sterilizing agent**

These are other types of biomedical waste, which should be properly disposed into the septic system; otherwise, it will be having deleterious effects on the environment releasing toxicity. [7]

#### **G. Non-Hazardous Waste**

It includes paper, cardboard, aluminum and plastics-Though this is general waste but it should also be minimize.

### **IV. MANAGEMENT OF DENTAL WASTE**

Dental Waste management is one of the most important challenges of modern world. Realizing this we can try to minimize the production of all these wastes and their potential hazardous environmental effects.

#### **A. Dental Amalgam (Mercury)**

Proper storage of unused elemental mercury in sealed containers should be done. It should not be placed in garbage or washed in the drain. Always use MERCURY SPILL KIT in case of spill of Mercury. Contact to certified biomedical waste carrier for disposal and recycling. Unused elemental mercury reacts with silver alloy to form scrap amalgam. Mercontainer TM (Sponge type) are best to store scrap amalgam. Empty amalgam capsules are non-hazardous so it can be thrown into regular garbage. ISO 11143 compliant amalgam separator on the suction lines is suitable over removing over 95% of the contact amalgam before diffusing into sewer system. Always wear Gloves, Mask and glasses while cleaning the suction taps. Disposable suction traps

USED developer is non-hazardous and is safe to be disposed to the sanitary sewer through the sink drains or toilet [5], [6].

#### **E. X-ray film**

Silver Recycling is recommended if film does not contain enough silver to make it dangerous

should be changed weekly. Container collecting scrap amalgam must be labelled HAZARDOUS WASTE SCRAP AMALGAM and should be transferred to local certified biomedical waste carriers [8].

#### **B. Lead**

Lead is a heavy metal and can cause neurotoxicity, carcinogenicity, hypertension, renal dysfunction and other immunological effects. The lead foil inside X-ray packets and lead aprons contain toxin can result into defilement of soil and groundwater in landfill after disposal so lead waste should only be handed to CWC. [6]

#### **C. Silver**

It is found in used X-ray fixer solution, used X ray film, and used dental amalgam. Used X-ray fixer solution can be processed onsite with a variety of available silver recovery units available in the market but publicly owned treatment works (POTW.) Discharge permit should be taken to ensure that the level of silver removal it provides meet the POTW discharge standards [9]. Used fixer from x-ray processing is a dangerous waste because it contains high concentrations of silver—3,000 to 8,000 parts per million (ppm). Anything over five ppm is dangerous waste and it is illegal to put used fixer down the drain, into a septic system or into the garbage so one should switch to Digital imaging rather than the photographic X-ray machine. Collect used fixer in a container marked “Used fixer only”. Keep fixer separate from your developer and contact local certified supplier to take it back. Keep disposal receipts if the flow of used fixer is at least 2-3 gallons per week it is suggested to use silver recovery units but they require high maintenance are not cost effective [5]

#### **D. X-ray Developer**

X ray developer and used fixer must be separated as Fixer cannot go down the drain and developer will ruin silver recovery systems. If used fixer and developer accidentally are mixed together, the mixture must be disposed of as dangerous waste so its proper separation is very important. Most x-ray developing machines have separate hoses or trays for these wastes, making it easy to keep them separate. Flush the drain thoroughly as you dispose of the used developer. Do not dispose of developer, whether used or unused, to septic systems, since it may cause them to fail. UNUSED developer contains hydroquinone, which is a toxic substance, so unused developer cannot go down the drain. Because hydroquinone is used up in the developing process,

otherwise silver recovery units must be used for high concentration of silver containing films. Used x-ray film contains silver. If the silver concentration were high enough, the used film would be a dangerous waste. Although most film does not contain enough silver to make it a dangerous waste, it is best to collect it for silver recycling [5].

#### F. Anatomical waste

Anatomical waste includes Excise tissues, organs, tumors; extracted teeth should be separated from other waste and must be disposed in yellow color biomedical waste. Double bag the waste and it should be labelled with a biohazard symbol and fill the bag until  $\frac{3}{4}$  level. Tie it tightly and contact to certified waste carrier local authority. Non-Anatomical waste like Blood soaked Gauze becomes a hazardous waste so must be disposed in yellow bag. Apply double bag with biohazard symbol, label it and sealed it properly. Keep it in refrigerator if onsite for more than four days. Once waste is collected, inform to certified local authority to collect [5].

#### G. Sharps

Needles syringes, scalpels, burs, acid, tips, blades and other sharp objects should be disposed in puncture proof red or metallic box and should be passed to certified local biomedical waste carriers for disposal [6].

#### H. Chemical disinfectant and other sterilizing agents

Dental instruments can be sterilized with dry heat and non-chlorinated plastic containers should be used to minimize environmental impacts and placed in the solid waste stream. Sterilizing agents, which are ignitable, should not be poured down the drain as they can explode. Sterilizing agents should not be poured into septic system as this may significantly disrupts the bacteria, which breaks down the waste [7].

### V. CONCLUSION

Biomedical waste management in Dental practice is equally important as for Medical Hospitals.

Dentistry is a profession dedicated to promoting and enhancing oral and well-being. Dental practitioner must recognize that some of materials and procedure provided to dental health services may present challenges to environment so measures should be taken by all dentists to minimize the production of these wastes and their potential environmental effects.

### REFERENCE

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Dental waste comprises of most of Hazardous waste so it is crucial issue that need efforts of team work of Dental set up and also needs government attention immediately .It is very important to spread awareness training or educate people and convince them to adopt practices for REDUCE, REUSE AND RECYCLE rather than generating crap. Safe and effective management of waste is not only legal necessity but also a social responsibility. Proper disposal of biomedical waste can reduce most of the health load in our country. It can be achieve by the proper awareness, implementation and utilization of the service provided by our government on the management of biomedical waste.

- Waste minimization strategy should be planned following Reduce, Reuse and Recycle.
- Proper methods should be planned to collect waste at its point of generation, segregation, packaging, labelling, moving, storing, treating and then transportation.
- Record should be maintained with details of quantity of waste generated, treated and disposed of.
- Training of staff handling biomedical waste management and other health care workers should be done. Continuing Dental Education Programme has to be conducted in pursuance to maintain health of the community
- Staff should be trained for Accidents like those that Mercury spill etc. and kit should be prepared for all type of spill like Mercury spill and Chemical spill.
- All Biomedical waste must be color coded and marked with the work place Hazardous Material Information system(WHMIS) biohazard symbol and can only be transported to certified local authority It is time to pay attention and spread awareness to all dental clinics

“LET THE WASTE OF THE SICK NOT CONTAMINATE THE LIVES OF THE HEALTHY.”