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Biomedical waste management in prosthodontic dentistry

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***Abstract*---**Biomedical waste (BMW) is a global issue today. Common producers of biomedical waste include hospitals, health clinics, nursing homes, medical research laboratories, offices of physicians, dentists, and veterinarians, home health care, and funeral homes. It must be properly managed to protect the general public, specifically healthcare and sanitation workers who are regularly exposed to

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biomedical waste as an occupational hazard. The materials used in prosthodontic dentistry are large in numbers. They are Impression Materials, Gypsum Products, Cements. And it was segregation according to colour code. If we want to protect our environment and health of community we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of community.

***Keywords*---**biomedical waste, impression materials, gypsum products, cements, color code.

Introduction

Biomedical waste is defined as any solid or liquid waste which may present a threat of infection to humans. It includes non-liquid tissue, body parts, blood, blood products, and body fluids from humans and other primates; laboratory and veterinary wastes which contain human disease-causing agents; and discarded sharps(1). Also included are the following:

- Used absorbent materials saturated with blood, blood products, body fluids, or excretions or secretions contaminated with visible blood
- Absorbent materials saturated with blood or blood products that have dried
- Non-absorbent disposable devices which have been contaminated with blood, body fluids; or secretions or excretions visibly contaminated with blood.

Clasification:(1,2)

The World Health Organization (WHO) has classified medical waste into eight categories:

- General Waste
- Pathological
- Radioactive
- Chemical
- Infectious to potentially infectious waste
- Sharps
- Pharmaceuticals
- Pressurized containers

Sources:(1,2,3)

Hospitals produced waste, which is increasing over the years in its amount and type. The hospital waste, in addition to the risk for patients and personnel who handle them also poses a threat to public health and environment.
Major sources:

- Govt.hospitals/Private hospitals/Nursing homes/Dispensaries
- Primary health centers
- Medical colleges and research centers/Paramedic services
- 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:

NEED OF BIOMEDICAL WASTE MANAGEMENT AND HANDLING:(4,5)

- Biomedical wastes, if not handled in a proper way, is a potent source of diseases, like AIDS, Tuberculosis, Hepatitis and other bacterial diseases.
- Nosocomial infections in patients from poor infection control practices and poor waste management.
- Drugs & Syringes which have been disposed of, being repacked and sold off to unsuspecting buyers.

Owing to the discussed potential threats this waste needs prime attention for its safe and proper disposal.

Management Of Bio-Medical Waste:(5,6)

The collection and transportation of BMW should be carried out in a manner 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.(5,6)

Incineration

It is a controlled combustion process where waste is completely oxidized and harmful microorganisms present in it are destroyed/ denatured under high temperature.

Autoclaving/Microwaving/Hydroclaving:(6,7)
Autoclaving is a low-heat thermal process where steam is brought into direct contact with waste in a controlled manner and for sufficient duration to disinfect

the wastes. Microwaving, microbial inactivation occurs as a result of the thermal effect of electromagnetic radiation spectrum lying between the frequencies 300 and 300,000 Mhz Hydroclaving is similar to that of autoclaving that the waste is subjected to indirect heating by applying steam in the outer jacket.

Shredder: :(6,7)
Shredding is a process by which waste are deshaped or cut in to smaller pieces so as to make the waste unrecognizable. It helps in prevention of reuse of BMW and also acts as identifier that the waste has been disinfected and safe to dispose off

Sharp Pit/Encapsulation
A sharp pit or a facility for sharp encapsulation shall be provided for treatment of sharp. An option may also be worked out for recovery of metal from sharps in a factory.

Effluent Treatment Plan: :(7,8)
A suitable effluent treatment plan shall be installed to ensure that liquid effluent generated during the process of washing containers, vehicles, floors etc is disposed after treatment.

Waste Segregation:(7,8)
The key to minimization and effective management of biomedical waste is segregation (separation) and identification of the waste. The most appropriate way of identifying the categories of BMW is by sorting the waste into colour coded plastic bags or containers.

Waste Transportation:(7,8)
Biomedical waste should be transported within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose. The trolleys have to be cleaned daily. Off site transportation vehicle should be marked with the name and address of carrier. Biohazard symbol should be painted. Suitable system for securing the load during transport should be ensured.

Treatment Equipments:(8,9)
As per the provision of BMW rules, waste falling in most of the categories can be treated in systems based on nonburn technologies.
Such waste account for about 90% of the waste streams in a health care unit.

Dental Wastes Of Environmental Concern: :(9,10)
Mercury has a potential to be hazardous if not managed. Therefore, it is important that the alloying reaction of mercury with silver alloy go to completion to ensure that mercury does not diffuse in to oral environment.
X-ray fixer, developer and cleaner solutions are considered a hazardous waste because of its high silver content. In the environment, free ionic silver acts as an enzyme inhibitor by interfering with the metabolic processes of organisms. These have to be disposed off as a hazardous waste or sent to a silver recovery system. The X-ray lead foils and lead shields contain pure lead

Materials used in prosthodontic dentistry

The materials used in prosthodontic dentistry are large in numbers. They are classified as follows(9,10)

1. Impression Materials
2. Gypsum Products
3. Cements
4. Others
5. Impression Materials

Segregation According To Colour Code: (2,9,10)
Red: (9,10)

- ❖ This group comes under waste category 3,6,7 which contains Microbiology & Biotechnology waste, Solid waste
- ❖ The type of container used for the segregation of this colour is Plastic bag/Disinfected container
- ❖ The waste under this category are treated by Autoclaving/ Microwaving/ Chemical treatment
- ❖ The waste under this category are as follows:

1) Amalgam: (fig-1)
   - Teeth with Amalagam fillings - hazardous. Dental amalgam particles are a source of mercury, which is known to be neurotoxic and nephrotoxic
   - It should be disposed of in the "Scrap Amalgam" container to avoid incineration
2) Impression Trays: (fig-2)
   - Since dental impression trays are expensive, they are cleaned after having been used so that they can be used repeatedly leading to cross infection
   - So they can be autoclaved and re used.
3) Metal Crown & Bridges , Waste Metal Pellets: (fig-3)
   - Metal poisoning of biological systems depending on degree of corrosion

Recycle, recasting of alloys for fixed prosthesis can be done without affecting its hardness

Fig-1:

Fig-2:

Fig-3:

Blue/White/Translucent: (9,10)

- ❖ This group comes under waste category 4,7 which contains Waste Sharps and solid waste
- ❖ The type of container used for segregation of this colour is Plastic bag/Puncture proof
- ❖ The waste under this category are treated by Autoclaving/ Microwaving/ Mutilation Shredding/ Chemical treatment
- ❖ The waste under this category are as follows

1) Offensive Waste: (fig-4)
   - The Offensive waste consists of Gloves, Mouth Masks, Infected plastic syringes, Tubings, Rubber dam sheets
   - If incinerated dioxins, furans and other harmful gases – carcinogenic
2) Waste Sharps: (fig-5)
   - The waste sharps include needles, syringes, Scalpels blades, glass vials etc.
   - They may cause puncture and cuts
   - This includes both used and unused sharps.

Fig-4:

Fig-5:

Yellow: (9,10)

- ❖ This group comes under waste category 1,2,3,6 which contains Human Anatomical waste, Microbiology & biotechnology waste, Solid waste
- ❖ The type of container used for segregation of this colour is Plastic bag
- ❖ The waste under this category are treated by Incineration/Deep burial
- ❖ The waste under this category are as follows:

1) Clinical Waste: (fig-6)
   - The Clinical waste consists of Extracted teeth, Human tissues, Organs, Body parts, Sharp needles, Microbiological waste
2) Solid Waste: (fig-7)
   - The solid waste consists of Infected cotton and Cotton Contaminated blood and body fluids cotton
   - It is disinfected and incinerated since it may cause source of infection
3) Cements & Zinc based compounds: (fig-8)
   - The zinc based compounds are toxic to aquatic organisms
   - The used cements should be collected and buried deep due to the toxic content

Fig-6:

Fig-7:

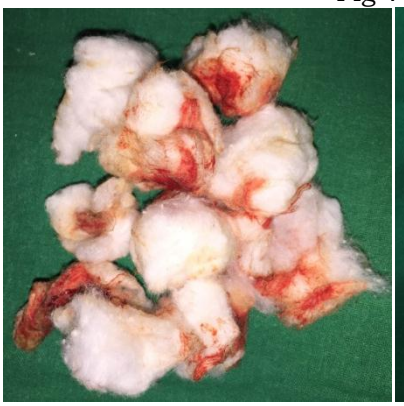
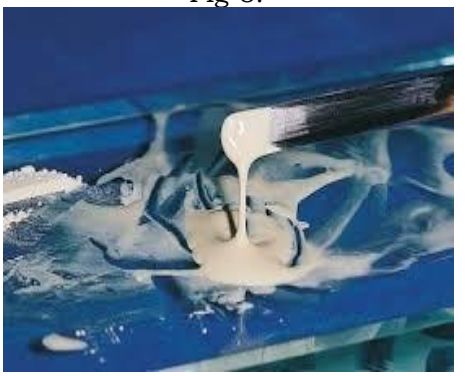


Fig-8:



Black: (9,10)

- This group comes under waste category 5,9,10 which contains Discarded medicines & Cytotoxic drugs, Incineration Ash (Ash from Incineration of any bio medical waste), Chemical waste (chemicals used in production of biological , used in disinfection, as insecticides etc.,)
- The type of container used for this colour code is plastic bag
- The waste under this category are treated by Disposal in secure land fields

❖ The waste under this category are as follows:

1) X-Ray Films: (fig-9)
   - Developed X- ray films are Non-hazardous
   - Has little residual silver and can be placed in the regular solid waste stream
2) Gypsum Products: (fig-10)
   - The gypsum products, casts poured by it and the investment materials should be disposed in landfill
   - If this material is disposed of at normal landfill it may produce hydrogen sulphide gas.
3) Acrylic items & Broken Dentures: (fig-11)
   - The Acrylic items are Non-Biodegradable,So its disposed with care,Hazardous-Burning of plastics releases carcinogens like dioxin and furan,It is dumped in long term land fill
4) Impression Materials:
   - The elastomeric impression materials are mostly rubber based materials,They are disposed in sanitary landfill

Fig-9:

Fig-10:

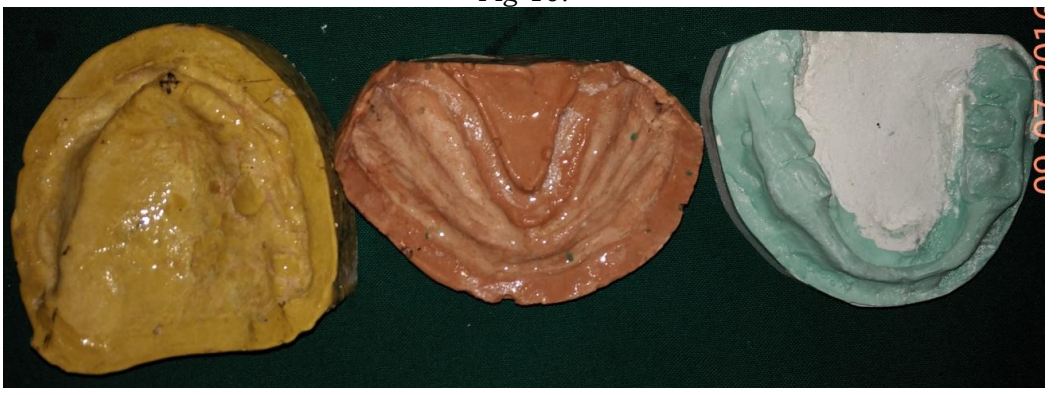


Fig-11:

Fig-12:

Conclusion

The absence of waste management, lack of awareness about the health hazards, insufficient financial and human resources and poor control of waste disposal are the most common problems connected with health-care wastes. An essential issue is the clear attribution of responsibility of appropriate handling and disposal of waste.

The challenge before us, therefore, is to scientifically manage growing quantities of biomedical waste that go beyond past practices. If we want to protect our environment and health of community we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of community.

- Thus refuse disposal cannot be solved without public education.
- Individual participation is required.

- Municipality and government should pay importance to disposal of waste economically.

Thus educating and motivating oneself first is important and then preach others about it.

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