



## Biohazard Waste Management in Dental Clinics, Overview and Cross Sectional Study

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### Abstract

*The amount of waste being made in the dental industry is considerably high but not that high as compared to other medical or health care facilities. Several developed countries have established an elaborated system for the management of health care wastes. But unfortunately, developing countries still tend to suffer from improper waste disposal, insufficient financial resources, lack of awareness of health hazards, and little data on health care waste generation and disposal. The dental disposal can be turned into non-hazardous waste by following proper guidelines.*

*In this study, about fifty-five private clinics were included. After the deep analysis of data, it was revealed that the prevalence of awareness of dental waste management was about ten percent.*

*The percentage of disposal of waste material without proper framework was quite high in both public and private sectors. The percentage or ratio who disposed of within the standardized method was less than ten percent and there was no one who threw the harmful garbage with standardized method.*

### Introduction

The amount of waste being made in the dental industry is considerably high but not that high as compared to other medical or health care facilities. Nevertheless, the point of concern is that the emission of these harmful wastes materials requires proper disposal under the regulatory policy to control the pollution caused by medical and dental wastes. The waste materials that are being generated at the dental clinics or more precisely dental industry include sharp and heavy wastes that include high metal density. In the dental industry for the diagnosis and treatment, many chemicals or medicines are being used that release harmful substances like amalgam, caustic

powder, x-ray fixer, disinfectants, etching acid, etc. Metal equipment which includes sharps are contaminated with blood and other bodily fluids at the clinic and dental offices and if they are not properly exposed then they can cause the exposition of patients and doctors to many other pathogens that include blood borne pathogens including HIV, Hepatitis B, and C and many other pathogens. Almost 20% of toxic and hazardous health care waste poses a grave threat to human health and pollutes the surroundings. It's quite ironic since health care products are supposed to save our lives but those heroes can also be the villains sometimes.

Even though dental clinics produce less hazardous waste they, nevertheless, add to that 20%. Dental waste is capable of causing serious damage to human beings and our environment. X-ray fixer and film, chemical disinfectants, dental amalgam, sharps and blood-soaked dressings are generally considered the main sources of the waste which is being produced by the dental clinics on the daily basis. With proper care and hygiene regulations these things can be disposed, undoubtedly, ensuring the reduction of the hazardous effects. But the major responsibility of the whole process lies on dental health professionals. Their ethical behaviors can significantly save many lives.

Several developed countries have established an elaborated system for the management of health care wastes. But unfortunately, developing countries still tend to suffer from improper waste disposal, insufficient financial resources, lack of awareness of health hazards, and little data on health care waste generation and disposal.

With the increasing number of Graduate dentists, the trend of dental waste is also increasing, simultaneously. Awareness should be raised among dental Care professionals regarding the proper disposal of dental waste and the health issues Involved and they should be encouraged to follow safe procedures. The dental disposal can be turned into non-hazardous waste by following proper guidelines. These dental wastes include:

- **Wastes that contain silver**

Silver x-ray fixer is being employed in the dental clinics for the development of X-rays and this is such a harmful material that is advisable not to rinse it off simply into the drain. With the help of a recovery unit, the fixer can be desilvered and after that, it can be mixed with water and can be disposed of in the sewage. It is allowed to dispose of the spent developer after diluting it with water. For the purpose of safety measures, x-ray cleaners without chromium are mostly suggested. On the other hand, underdeveloped X-ray films contain a high amount of silver that is extremely dangerous

and should be treated as hazardous. It is suggested that if there are unused films that are in need of disposition, they should be disposed of by disposing of companies as per instructions in a recyclable box. The usage of digital X-ray units diminishes the buying of new X-ray films.

- **Wastes that contain mercury**

Mercury is a harmful element. Mercury is said to be a nephrotoxic, neurotoxic, and bioaccumulative element and in the dental industry, the amalgam particles are considered as a source of mercury. It has the ability to get in flow with the environment through water and vapors. Vapors that contain mercury waste management include that unused mercury should be kept in an air-tight sealed jar. For the purpose of recycling and disposal, it is suggested to have a certified biomedical waste carrier. It is advised to use a mercury spill kit and most importantly do not throw the element mercury in the garbage and also do not wash the element mercury in any case.

- **Dripping gauze or Blood soaked**

This is not that much dangerous but still, it is considered a dangerous waste that needs to be disposed of under careful consideration. They should be disposed of in a yellow bag that has biomedical hazard symbol on it and it should be double packed. When it is all done, contact can be made with CWC for the proper disposal.

- **Sanitizer and other chemicals**

The staff which handles these materials and chemicals should be trained and professional. It is generally advised that all the equipment should be used sterilized using steam. Non chlorinated plastic containers should be used to minimize environmental waste. Ignitable sterilants should not be directly thrown into drains as they have the capacity to explode. Apart from this, HCOC sterilants should not be exposed directly (Musliu, Beqa, & Kastrati, 2021).

- **Sharps**

This includes scalpel, needles, burs, acid etch tapes, and gloves. They should be exposed in a red bag that is closed with a tight lid. At that container, there should be a symbol of biomedical hazard (Agarwal, Singh, Bhansali, & Agarwal<sup>2</sup>, 2012).

There are several guidelines as given by the World Health organization for the proper disposal of dental and medical wastes that should be followed.

According to a study conducted in India, 35.7% of health care workers did not use to separate the wastes before disposing of them. On the other hand, about 15.9% of waste was mixed with domestic waste in the process of disposing of. Another study conducted in the city of Iran declared that about 91.14% of garbage was domestic and 2.14 and 6.7 percent were chemicals and toxins. However, there are no published studies in southern Iran. Therefore, research was conducted to see the practice of waste disposal in both the private and public sectors. This study was conducted in one of the universities of Iran for five months (Lakbala, 2020).

### Material and Method

In this study, about five hundred and fifty-five private clinics were included. After the deep analysis of data, it was revealed that the prevalence of awareness of dental waste management was about ten percent. During the time of study about four hundred and sixty-nine private offices, seventy-three private clinics, and fifty-three public offices. Using the method of sampling, a few numbers clinics were chosen that included eighty-six private offices, fourteen clinics that were private, and ten public clinics. The data was gathered on the basis of collection and disposal of dental waste material especially wastes that contain mercury, silver, amalgam, lead, and other domestic waste.

### Results

This table shows the levels and percentage of assortment and disposal of waste material that include mercury, silver, amalgam, and other both hazardous and domestic garbage. And it showed that about ninety percent of the dental clinics disposed of the dental waste along with domestic waste and only sixty percent of the dental clinics and medical staff followed the standard method of disposing of the waste.

**Table 1:** Collection and disposal of different types of dental waste

Types of Waste	Collection of Waste, n (%)				Disposal of Waste, n (%)			
	Plastic bags (Black)	Plastic bags (Yellow)	Boxes for Safety	Marked container	Domestic waste	Infectious waste	Sharps waste	Sum up
Domiciliary	105 (95.5)	7 (6.5)	NA*	-	105 (95.5)	7 (6.5)	-	-
Contagious	8 (7.2)	96 (87.2)	3 (2.6%)	-	99 (90.1)	13 (11.9)	-	-
Sharps	2 (1.9)	9(8.3)	102 (92.8)	-	41 (37.4)	5 (4.6)	67 (61)	-
BioPharmaceutical	25 (22.6)	66 (59.9)	9 (8.1)	7 (6.4)	66 (60)	34 (30.9)	10 (9.1)	0 (0)

The result of disposing of garbage with specific regard to amalgam and harmful material is shown in table 2. It predicts that there was not even one clinic that was following the standardized method of disposing of the x-ray fixer and wastes that contain lead. The ratio of recycling of amalgam for future use was only ten percent and that shows the carelessness on the part of doctors and

healthcare staff when they are aware of the fact that these substances are extremely harmful and pose threats not only to them but patients and general public as well because they contain pathogens that are extremely infectious and cause contagious disease like HIV, AIDS, Hepatitis B and C.

**Table 2:** Disposal and Collection of x-ray fixer,amalgamand lead foil waste

Types of Waste	Collection of waste				Disposal of waste				
	Plastic bags (Black)	Yellow plastic bags	Special container	Poured in the sewage	As domestic waste	As infectious waste	Poured in the sewage	Evaporation	Recycle to the manufacturer
Amalgam	4 (3.7)	6 (5.6)	97 (90.7)	NA*	66 (61.7)	23 (21.5)	9 (8.4)	NA	9 (8.4)
X-ray fixer	-	-	14 (20.7)	54 (80.3)	-	-	63 (93.9)	4 (6.1)	0 (0.0)
Lead foil pockets	20 (40)	24 (48)							

A comparison of the interests of people and their behavior with regard to disposal is presented in table 3. According to the results, the ratio of difference was quite significant.

**Table 3:** Comparison between the standards of private clinics, public clinics, and offices

Waste disposal and collection	Offices (Private)	Clinics (Private)	Clinics (Public)	p value
<b>Amalgam.</b>				
Collections	75 (90)	15 (101)	10 (91)	0.534
Disposals	6 (7)	4 (22)	3 (21)	0.177
<b>X-ray fixer.</b>				
Collections	12 (26)	2 (8)	2 (15)	0.439
Disposals	0 (0)	0 (0)	0 (0)	—
<b>Domestic.</b>				
Collections	80 (93)	14 (100)	10 (100)	0.413
Disposals	79 (92)	14 (100)	10 (100)	0.352
<b>Lead.</b>				
Collections	3 (10)	0 (0)	3 (50)	0.006
Disposals	1 (3)	1 (7)	2 (33)	0.047
<b>Infectious.</b>				
Collections	74 (86)	13 (93)	10 (100)	0.366
Disposals	7 (8)	5 (36)	0 (0)	0.005

**Discussion**

The percentage of disposal of waste material without proper framework was quite high in both public and private sectors. The percentage or ratio who disposed of within the standardized method was less than ten percent and there was no one who threw the harmful garbage with standardized method. Mercury is a harmful element. Mercury is said to be a nephrotoxic, neurotoxic, and bio accumulative element and in dental industry, the amalgam particles are considered as a source of mercury. It has the ability to get in flow with environment through water and vapors. Vapors

that contain mercury waste management include that unused mercury should be kept in air tight sealed jar. For the purpose of recycling and disposal, it is suggested to have a certified biomedical waste carrier. It is advised to use mercury spill kit and most importantly do not throw the element mercury in the garbage and also do not wash the element mercury in any case. This is not that much dangerous but still it is considered as a dangerous waste that needs to be disposed of under careful consideration. They should be disposed of in a yellow bag that have biomedical hazard symbol on it and it should be

double packed. When it is all done, contact can be made with CWC for the proper disposal. The disposal of other material that include gloves and other safety measures that are used by staff should be properly sorted out. As per the results of the research that was conducted it was prevalent that none of the staff both private and public clinic didn't bother to care about these things as they were throwing it away without standard methods. It is advisable that staff which handle these materials and chemicals should be trained and professional. It is generally advised that all the equipment should be used sterilized using steam. Non chlorinated plastic containers should be used to minimize the environmental waste. Ignitable sterilants should not be directly throw into drains as they have the capacity to explode. Apart from this, HCOC sterilants should not be exposed off directly (M Danaei, et al., 2014).

According to the world health organization, the waste from health care is harmful and should be treated as discarded because it has the potential of the high level of transmitting diseases not only to humans but animals as well. A study conducted in Greece evaluated that the amount of dental clinic garbage from one clinic in one day was estimated to be fifty-three gm and that was per patient. And just think about the amount of garbage from all patients and from different dental clinics and the harmful pathogens they are adding up in the environment (Sabahi, 2020). Amalgam is said to be an alloy of mercury that is being used in the restoration of problems of teeth. When amalgam is allowed to be set in the environment it can be a source of release of many harmful chemicals, which is why it is suggested rather strongly to ban the disposal without structured restrictions. Mercury is the most harmful ever as it contains neurotoxic that can are extremely harmful for the health of humans.

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