

Original Article**Inside the Disposal Box: A Study on Biomedical Waste Awareness Among Aspiring Dental Professionals**Sabiha S. Tamboli¹, Faraz Tamboli²**Abstract**

Background: Biomedical waste management across India has become a growing concern for dentists. This study investigates biomedical waste management knowledge in the context of dental education. The aim of this study is to determine the knowledge, compliance and understanding levels of dental students regarding the processing and disposal of biomedical waste. **Methods:** This study was conducted among students and interns of a rural dental college in Maharashtra, India. A pre-designed survey was administered to dental students in various academic years. Investigations include waste classification, segregation, disposal technologies, safety procedures, and environmental impacts associated with biomedical waste. **Results:** A total of 150 students participated. The male/female ratio is 1:1.31. On average, 88% and 12% of students have correct and incorrect information about biomedical waste. **Conclusion:** The results of this study can form the basis for the development of educational strategies and interventions to raise awareness and ensure responsible biomedical waste management in medical education, dentistry, and medical facilities.

Keywords: Biomedical waste management, aspiring dental professional, environment, Knowledge, awareness

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Introduction

Waste produced by medical treatments, immunisation and laboratories is called “health waste” or biomedical waste. Advances in healthcare facilities have led to an increase in the amount of waste produced by healthcare facilities. We all know that waste is hazardous and must be disposed of safely¹.

Biomedical wastes may pose a threat to human health and the environment as they may contain infectious, toxic or sharp substances that can cause injury and diseases². Therefore, proper handling, separation, transportation, treatment and disposal of biomedical waste is important to

prevent contamination³.

Dental waste is biomedical waste from dental offices, hospitals and laboratories. Dental waste includes items such as extracted tooth, blood-soaked cotton swabs, used needles, amalgam waste, x-ray films, and antibiotics⁴. Mismanagement of waste can expose dentists, patients, waste handlers, and the general public to a variety of hazards, such as mercury poisoning, needle induced injury and infectious diseases⁵. Additionally, dental waste can contaminate soil, water and air, causing infections.

India has developed an effective policy for processing and management of biomedical waste.

1. Professor & Head, Department of Microbiology, Parbhani Medical College and RP Hospital Research Institute, Parbhani, Maharashtra, India
2. MBBS Student, Government Medical College, Chandrapur, Maharashtra, India

Correspondence to: Dr. Sabiha S. Tamboli, Department of Microbiology, Parbhani Medical College and RP Hospital Research Institute, Parbhani, Maharashtra, India. Email: sabihatamboli77@gmail.com

The Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016) state that all hospitals must take all necessary measures to ensure that biomedical waste, including dental waste, is disposed of in a manner that does not harm human and environmental health. However, the implementation and enforcement of these policies is often inadequate and inconsistent due to many factors, including lack of knowledge, training and oversight. Therefore, there is a need to evaluate the current status of BMW management in India and identify gaps and problems.

The aim of this study is to determine the knowledge, attitude and practice (KAP) towards BMW management among dental students and interns in rural dental college Maharashtra, India. This study also aims to compare the KAP of different groups of dental students and trainees and investigate the factors affecting their KAP.

Methods

This is a cross-sectional study conducted among third and final year dental students and interns in remote dental schools in Maharashtra, India. The study was conducted between January and March of 2018. Data collection tool is a self-administered survey. A survey was administered to 150 students and interns who agreed to participate in the research. The survey addressed four aspects: knowledge, attitudes, practices and interventions regarding dental waste management. The survey was pre-tested on a sample of 20 dental students and trainees and its reliability was confirmed. Survey questionnaire were distributed in the lesson plan. Participants were informed about the study and its aims and asked to fill out the survey within 20 minutes.

Results

Of the 500 dental students and interns, 150 (i.e., 30%) students participated in this study. Of the 150 dental students and interns 85 (56.67%) were female and 65 (43.33%) were male students participated, including 50 third-year students (33.33%), 50 fourth year BDS students (33.33%), and 50 interns (33.33%) (Table 1). Among 150 students, 47.33% of students have excellent knowledge and know how to manage BMW, 26.67% have good knowledge, 14% have moderate knowledge, 12% have poor knowledge (Table 2). One (1) point for each correct answer, 0 point for each incorrect answer was given. Total score greater than 70%, between 45% and 75%, between 20% and 45% and <20% was generally considered excellent, good, moderate and weak respectively. 64.67% follow proper waste management by disposing of their waste in municipal waste collection facilities. Only 66.67% of the students responded correctly to the extracted teeth. 15.33% of dentistry students could not put needles, syringes and cutting tools in the correct coloured bags (Table 3).

Table 1: Demographic characterisation of the participants

Demographic variable	Frequency	Percentage
<i>Gender</i>		
Male	65	43.33%
female	85	56.67%
Total	150	100%
<i>Year of study</i>		
Third year	50	33.33%
Final year	50	33.33%
Internship	50	33.33%
Total	150	100%

Table 2: Knowledge level of students and interns regarding BMW management

Level of knowledge	3 rd year	Final year	Interns	Total
Excellent knowledge	16(32%)	25(50%)	30(60%)	71(47.33%)
Good knowledge	15(30%)	12(24%)	13(26%)	40(26.67%)
Moderate knowledge	8(16%)	8(16%)	5(10%)	21(14%)
Poor knowledge	11(22%)	5(10%)	2(4%)	18(12%)
Total	50(33.33%)	50(33.33%)	50(33.33%)	150(100%)

Table 3: Correct knowledge, awareness and practice of students and interns regarding hospital waste management

Questions	3 rd year	Final year	Interns	Total
Do you know various colour bags in BMW	19(24.05%)	28(35.44%)	32(40.51%)	79(52.67%)
Are you aware of existing medical waste management policy in India	25(24.27%)	37(35.92%)	41(39.80%)	103(68.67%)
Where should the dental waste be disposed	21(25.30%)	26(31.32%)	36(43.37%)	83(55.33%)
How to remove accidental spill of mercury in the clinic?	18(18.95%)	40(42.10%)	37(38.95%)	95(63.33%)
The most effective way to dispose cotton gauze	25(25.51%)	31(31.63%)	42(42.86%)	98(65.33%)
Where to dispose extracted tooth and used impression materials	17(17%)	39(39%)	44(44%)	100(66.67%)
Expired medicine comes under which waste category	15(22.73%)	26(39.39%)	25(37.88%)	66(44%)
What do you think the most common problem in management of biomedical waste in your hospital	20(24.39%)	23(28.04%)	39(47.56%)	82(54.67%)
What are the current rules and guidelines for dental waste management in India?	25(32.89%)	26(34.21%)	25(32.89%)	76(50.67%)
How knowledgeable are the dental students and interns about the dental waste management process and its importance?	23(27.38%)	28(33.33%)	33(39.28%)	84(56%)
How positive are the attitudes of the dental students and interns towards the dental waste management process and its benefits?	18(24.66%)	26(35.62%)	29(39.73%)	73(48.67%)
What are the barriers and challenges faced by the dental students and intern in the dental waste management process and its implementation?	29(40.28%)	24(33.33%)	19(26.39%)	72(48%)
What are the potential impacts and benefits of improving dental waste management in India for the dental profession, public health and environment protection?	31(26.96%)	39(33.91%)	45(39.13%)	115(76.67%)
Have you attended any training on dental waste management	17(20%)	32(37.65%)	36(42.35%)	85(56.67%)
Do you think you need more training regarding dental waste management	28(32.56%)	31(36.04%)	27(31.39%)	86(57.33%)
Do you segregate the waste before disposal	32(27.59%)	41(35.34%)	43(37.07%)	116(77.33%)
Do you hand over waste to municipal garbage collector	24(24.74%)	35(36.08%)	38(39.17%)	97(64.67%)
Do you use puncture proof container to discard needles	43(33.86%)	39(30.71%)	45(35.43%)	127(84.67%)
Which colour code bag do you use to dispose soiled cotton gauze	30(30.61%)	27(27.55%)	41(41.84%)	98(65.33%)

Discussion

Most biomedical waste research was conducted by medical personnel. Few studies have been conducted on dental students. The increase in dental diseases and caries has led to increased waste in

dental clinics. If these wastes are not evaluated scientifically, they will pose a threat to human health and the environment. Although there are rules and regulations, there is a lot of doubt among dentists about following biomedical waste management procedures. This laxity leads to ignorance of

existing laws, as can be seen in many studies^{6,7}.

Biomedical waste carries a higher risk of contamination than other types of waste. Inadequate knowledge and misuse can have a serious impact on the environment and lead to serious diseases. Mismanagement of dental waste exposes workers in dental facilities, waste processors, and communities to a variety of diseases and toxins. Lack of training causes dentists to cause environmental degradation⁸.

In our study, 43.33% of the participants were male and 56.67% were female, while in Bansal et al study, 52% were male and 48% were female⁹. 50 of the participants were third-year students (33.33%), 50 were fourth year BDS students (33.33%), and 50 were interns (33.33%).

The aim of this study was to determine the knowledge, attitudes and practices of dental students at this institute regarding biomedical waste management. In our study, it was seen that interns were more knowledgeable about biomedical waste management than final and third year students. This finding is consistent with Indhulekha et al. in 2018 study¹⁰. It is thought that this low result may be due to inadequate education of dental students and interns. While 52.67% of the participants in our study were aware of the colour coding of biomedical waste, a study conducted in 2008 found that 72% of the participants were aware of the colour coding¹¹. Approximately 68.67% of the participants in our study were aware of dental waste generated in health facilities, it is similar to the study of Bansal et al.¹² Dentistry generates various types of hazardous waste, which may include materials or liquids that may include pads, gloves, masks, syringes, toothpaste, medications, toothbrushes, wax, dental amalgam, and other products containing saliva and blood. This can be harmful to patients, doctors, and even the environment^{13,14}.

We observed that the majority of dental students were aware of the concept of biomedical waste and 68% were aware of the biomedical waste legislation in India. This relates to the study by Charania and Ingle where 72% of dentists were aware of biomedical waste and disposal laws in India¹⁵. In the present study, 57.33% of students believed they needed more training in biomedical waste management, while in one study, 97% of students wanted additional training¹⁶. Therefore, students need to be trained more to manage BMW. Only 64.67% followed proper dental management

practices by disposing of their waste in municipal waste collection facilities. Only 66.67% of the students responded correctly to the extracted teeth. 15.33% of dentistry students could not put needles, syringes and cutting tools in the correct coloured bags. Therefore, although interns were found to practice better than senior and junior students, most of the students in this study did not practice correctly. Although most of our dental students are aware of the waste disposal problem, most of them do not follow proper biomedical waste disposal methods, similar to the research of Bangenmavar et al.¹⁷ Safe management of medical waste becomes great importance when it comes to protecting the environment and public health¹⁸.

According to the results of the present study, we suggest that studies on biomedical waste should be continued. Management and ongoing monitoring of good biomedical waste management should be encouraged, as well as clear knowledge and good attitudes among teachers and students regarding the disposal of waste in appropriate containers. Guidelines for regular training should be developed for all healthcare professionals. Biomedical waste laws must be applied meticulously at every stage. To prevent injuries, all medical facilities must activate a legal injury reporting system. However, the limitation of this study is that it is limited to one institute; hence, the results might not be generalized.

Conclusion

To conclude, general training on vertical or horizontal pattern of biomedical waste every year should be conducted. Our research shows that half of dentistry students do not have sufficient knowledge about biomedical waste management. Regular on-the-job training using the latest information will increase students' knowledge and skills. Dental students are also responsible for understanding safety precautions and ensuring that waste is disposed of appropriately once identified.

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