

# Knowledge, Attitude, and Practice Regarding Biomedical Waste Management among Dentists

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## Abstract

**Background:** With increase in number of dental clinics every year, biomedical waste (BMW) production increases accordingly. Management of these wastes is a major part of clinical practice.

**Aim and Objective:** The objective of this study is to assess knowledge, attitude, and practice of BMW management among dental students and practitioners.

**Materials and Methods:** This study involved 105 participants from undergraduates to private practitioners. The self-structured questionnaire survey comprised 30 questions and it was conducted online. The data collected were transferred to version 20 SPSS software for statistical analysis.

**Results:** This study shows that about 60–80% of participants were aware of different categories of waste segregation, steps in waste disposal and they also practice it. Around 70% of them practice the correct method for mercury disposal and 84% in disposal of sharp needles. The major concern is about radiological waste disposal. Only 34% knew about desilvering of fixer solution and 24% about recycling lead. More than 80% of the participants propose for proper training of the staffs handling BMWs.

**Conclusion:** In this study, the postgraduates and interns had more awareness compared to the undergraduate students. There is a lot of inadequacy in knowledge and practice which can be rectified from proper education and training at their early days of clinical practice.

**Key words:** Biomedical waste, Lead, Scrap amalgam, Waste disposal

## INTRODUCTION

Biomedical wastes (BMWs) are any form of wastes (solid, liquid, and fluid) produced from a health-care setup. Dental practitioners contribute to a large amount of BMWs, though comparatively less than the medical wastes, it can be equally hazardous. According to the BMW management rules, 2016 BMW is defined as any waste produced during examination, management, or immunization of humans/animals or research activities

associated or in the laboratories or health camps.<sup>[1]</sup> BMW management rules provide guidelines and protocol to be followed at every steps of waste management which includes waste survey, waste segregation followed by color coding, waste accumulation, waste storage, waste transportation, waste treatment, and waste disposal.<sup>[2,3]</sup> It is necessary for every health-care professional to be aware of the guidelines of BMW management and to follow them appropriately.

BMWs from dental health care include both hazardous and non-hazardous wastes. The hazardous wastes are infectious, pathological, pharmaceutical, sharps, and chemical and radiological wastes. These hazardous wastes are produced in lesser amount but improper handling can contaminate non-hazardous wastes and pose a greater risk to both human health and environment. Improper management of BMWs can lead to various health hazards such as HIV

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and hepatitis B and C infections.<sup>[2]</sup> Hazards that are resulted from BMWs are environmental burden.<sup>[4]</sup>

Dentists are at higher risk of infection due to direct or indirect exposure to human blood and saliva. The infection can be transmitted by contaminated dental materials and equipment, aerosols, and droplets.<sup>[5]</sup> Improper disposal of mercury and X-ray processing solutions can be more dangerous to the environment and the dentists. Health care workers who are exposed to and handling BMWs are more prone to health hazards. Hence, it is necessary for them to be trained and to follow all the guidelines to ensure proper management of BMWs.<sup>[5,6]</sup>

**Objective**

With increase in number of dental clinics every year, production of BMWs also increases which demands appropriate way of managing the wastes.<sup>[2,5,7]</sup> It is essential for every health-care provider to be aware of management protocols. Hence, the purpose of this study is to assess the knowledge, attitude, and practice (KAP) among dentists in BMW management.

**MATERIALS AND METHODS**

A questionnaire-based survey was conducted on KAP of BMW management among dentists. There were totally 105 participants in this study which included all undergraduates, interns, postgraduates, and private practitioners.

The survey consisted of self-structured questions regarding KAP of BMW management. Initial part of the questionnaire contained demographic details of the participants such as age, gender, and educational qualification followed by 30 questions. The questionnaire survey was conducted online and the data were collected in Google Forms. Thereupon, the collected data were tabulated in Microsoft Excel sheet and transferred to version 20 SPSS software for statistical analysis.

**RESULTS**

The study involved about 105 participants in total, among them 33 were male and 72 were female [Figure 1] with minimum age of 17 years to maximum age of 39 years. The educational qualification of the participants was distributed as 23.8% of the 1<sup>st</sup> year, 1% of the 2<sup>nd</sup> year, 3.8% of the 3<sup>rd</sup> year, 15.2% of the 4<sup>th</sup> year, 13.3% of house surgeons, 19% of postgraduates, and 23.8% of private practitioners [Figure 2]. The participants had 30 questions to answer based on their knowledge, awareness/attitude, and practice of BMW management.

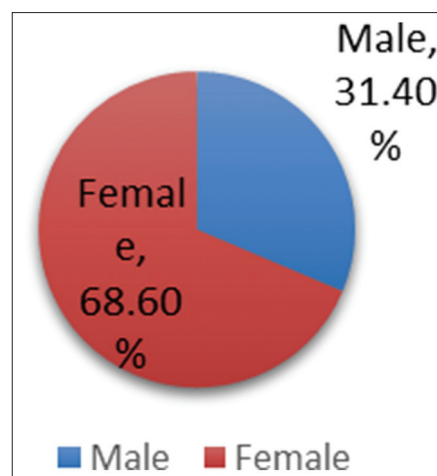


Figure 1: Distribution of gender among the participants

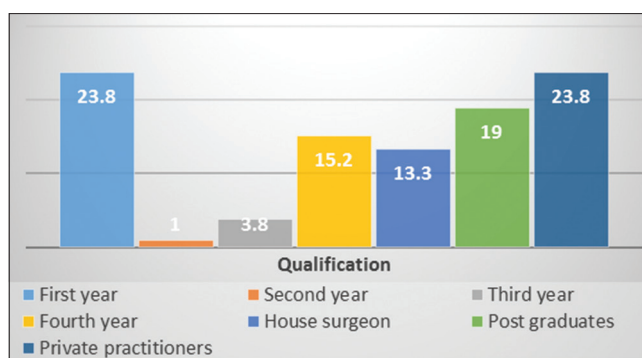


Figure 2: Distribution of educational qualification

Based on the knowledge about the government guidelines on BMW management, majority of the participants were well known that the guidelines are applicable to the dentists as they produce considerable amount of BMWs. However, they were not fully aware of the maximum storage time for untreated wastes, which is not more than 24 h. On awareness about the disposal of BMW, about 60–80% had awareness about the different categories of waste segregation, steps involved in management, and color coding of BMWs and they also practice it. About 67.6% were able to differentiate hazardous dental wastes from the given options. About 55.2% chose the right color codes used for waste disposal.

Disposal of mercury is the major part of the BMW management in dental practice. Mercury obtained in scrap amalgam form or elemental form should be properly stored in a sealed airtight container. More than 70% of the participants seem to be well aware of it. About 84% of them discard sharp needles by breaking it before disposing.

Radiological waste disposal is also a major concern in the management of BMW. Only 34% knew about desilvering fixer solution, the rest were oblivious of it. Lead toxicity

can be prevented by collecting and recycling it without having to lead into a sewer. In this study, only 24% have the similar opinion while 25% were clueless and the rest proposes to store the lead separately. About 64% of the participants believe that the use of digital X-rays might help in minimizing radiological wastes.

Almost 80% of them anticipate the use of personal protective equipment (PPE) and proper training for those who handle BMWs.

## DISCUSSION

The KAP study was conducted among 105 participants which included practicing dentists, dental interns, and dental students. The student category comprised both UG and PG, starting from the 1<sup>st</sup> to final year. With fast-growing dental clinics in the community, questions comprising basic knowledge of BMWs, awareness of managing BMW, and practical steps taken in workplaces were put in the questionnaire and answers were collected. Around 92% of the participants in this study were aware of BMW management guidelines that are applicable to dental professionals. This is similar to the study done by Khubchandani *et al.*<sup>[2]</sup> and slightly differs with that of Mazhar *et al.*<sup>[1]</sup> which had only 63% of the participants being aware of the guidelines. About 96% of the participants think that improper way of BMW disposal can lead to environmental hazards which is similar to the study of Chopra *et al.*<sup>[8]</sup> According to WHO, there are about eight categories of BMWs and according to Central Pollution Control Board, there are about 10 categories of BMWs.<sup>[6,9]</sup> In our study, about 60–70% were aware of the different categories of BMW segregation and also claim to have been following it in their workplace. This observation was poor compared to the study of Pawar and Patil and Naidu *et al.*, but a slightly better than the study of Sudeep *et al.*<sup>[5,10,11]</sup> As the steps involved in BMW management are mentioned above,<sup>[1]</sup> awareness of those steps among the participants in our study constitutes to 76.2%. Awareness about color coding of BMW is 80% in our study which is close to the studies of Pawar and Patil<sup>[10]</sup> and Naidu *et al.*<sup>[5]</sup> but very high compared to other studies.<sup>[1,11]</sup> The BMWs can be separated as hazardous and non-hazardous wastes.<sup>[6]</sup> About 81% of this study participants were able to differentiate BMWs which is in contrast to other study done by Mehta *et al.*<sup>[12]</sup> Among the most hazardous type of wastes produced by dentists, the mercury is of great consequence. The scrap mercury that is obtained from the remains of amalgam fillings has to be stored in an airtight container and disposed, the sharp needles from syringes have to be broken before disposal and have to be discarded strictly in white color bags. Around 70% of the participants

in this study were well aware of mercury waste disposal while only 42% and 41.7% of them disposed correctly according to the study done by Naidu *et al.*<sup>[5]</sup> and Pawar and Patil,<sup>[10]</sup> respectively. Around 84% in our study were aware of the proper disposal of needles which was way more when compared to the study conducted by Pawar and Patil<sup>[10]</sup> that is only 31.2%. Another major contribution to the BMWs from dentists is radiological wastes. With the fact that fixer solution has to be desilvered before disposing, only 34% of them were right and this is better considering the study of Naidu *et al.*,<sup>[5]</sup> in which 17.6% chose to dilute and led into sewer. Lead toxicity can lead to several health and environmental hazards.<sup>[9]</sup> This can be prevented when this is collected and recycled in the right way.<sup>[6]</sup> In this study, about 25% of them were clueless about it and 24% of them claimed to have known about it and practicing it, while in the study conducted by Naidu *et al.*,<sup>[5]</sup> majority of them do not use X-ray films and about 20% suggests to store separately which is in similar to our study. Avoiding conventional X-ray films lead us to the use of digital X-rays.<sup>[3,13]</sup> About 64% of the participants believe that with increased usage of digital X-rays, a huge percentage of radiological wastes can be reduced. Incineration is the better option for BMW destruction.<sup>[3,6,14]</sup> It has the advantage of reducing the wastes by 50–400 times<sup>[15]</sup> but it cannot be used for every category of BMW which is accepted by 58% of the participants. However, incineration releases dioxins which seem to be harmful for the environment.<sup>[15]</sup> In our study, only 23% of them feel that incineration is harmful. Furthermore, half of the participants think that infectious wastes need to be sterilized or disinfected before shredding/disposal which is in contrast to the study of Khubchandani *et al.*<sup>[2]</sup> About 80% of the participants think that it is necessary to properly label the disposing bags and containers which is closely related to the study by Khubchandani *et al.* and Mehta *et al.*<sup>[2,12]</sup> and also they were very clear about reaching out to certified BMW carriers once the color coded bags are full but still 11% of them were not fully aware about BMW carriers and claimed to have been dumping the BMWs in municipal bins. This correlated to the study of Kumar and Padmaja.<sup>[4,16]</sup> The percentage of answers was equally distributed among 24 and 48 h when it comes to the maximum storage timing of untreated BMWs as 29–48%, respectively. This was approximately close to other studies.<sup>[1,2,8,11,12]</sup> This is due to the lack of knowledge about the guidelines that are released by the government. It must be made sure that everyone to be properly educated in storing and disposing the wastes in right manner and time period.

When it comes to the knowledge of whether the staffs handling BMWs should be trained, 81% of the participants gave a positive answer. The usage of PPE for the personnel handling BMW had a wavering percentage between 50% and 41% answering YES and MAY BE which is similar

to the study of Mazhar *et al.*<sup>[1]</sup> With PPE, a lot of health hazards can be reduced and radiological harms can be kept at bay. This includes acquiring infections such as HIV and hepatitis. A little infected needle prick might go a long way for the handlers if not disposed in a prick proof bag. About 45% of the participants do not seem to think that BMW management is expensive and time consuming while the remaining feels contrast to this. This study proved that not all practitioners are familiar with certified BMW carriers and methods. This is mainly because around 42.9% of the participants have not registered under an authorized government organization for BMW disposal where only 39% of them have proper registration for BMW disposal.

In entirety, most of the participants are aware but still need a review of all the steps, methods, and procedures followed in BMW disposal. In this study, the postgraduates and interns had more awareness compared to the dental undergraduate students. There are a lot of inadequacy in knowledge and the practices that are followed. This can be rectified by taking students to the actual area for field visits where wastes are disposed and processed so they gain better idea of the actual procedures and tend to start practicing in their early days of clinical practice. The practitioners should also be up to date in all the rules and regulations that are issued by the government.

## CONCLUSION

It is the sole responsibility of every health-care professional to ensure safe environment to the public. Lack of concern and motivation among the dentists on BMW management should be corrected. Minimization of BMWs should be practiced by every individual. It is important for every dental student and practitioner to follow proper guidelines for the management of BMWs. Any lack of knowledge or proper training over waste disposal shall be improved. BMW management has to be part of the dental curriculum

to ensure proper knowledge and practice among dental students.

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