

Original Research Article

Current knowledge, attitude and practices of dental residents towards biomedical waste management: A cross sectional study

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ABSTRACT

Aim: To assess the knowledge, attitude and practices towards biomedical waste (BMW) management among residents of dental colleges of Davangere city.

Methodology: A cross-sectional questionnaire based study was carried out among 150 residents from dental colleges (85 from College of Dental Sciences and 65 from Bapuji Dental College and Hospital) in Davangere Karnataka. The responses were analyzed using Frequency distribution and Pearson Chi Square test using SPSS (Statistical package for social sciences, software Version 22.0)

Results: 94% residents said that they were aware about BMW management out of which 90% could correctly describe the BM waste. Out of 150, 71% residents were aware about the storage duration. Only 41.3% residents knew the correct symbol for biohazard. When asked about color codes for disposal of waste only 50.7% residents knew the color code for the disposal of human anatomical waste and 58.7% residents knew the correct color code for the disposal of used gloves and masks.

Conclusion: Though majority of the residents had fair knowledge of BMW management, the need for training regarding their practice of BMW disposal should be the focus.

Keywords: Biomedical waste, Residents, Waste management

INTRODUCTION

In the field of dentistry, a number of materials are used on a day-to-day basis. This, in turn, leads to the generation of large amount of waste such as plastic, latex, glass, metallic foils, sharps, cotton, gauze, extracted teeth and soft tissues, and various dental materials which are contaminated with body fluids. Studies have shown that wastewater from dental offices typically contains elevated concentrations of metals such as mercury, silver, copper, tin, and zinc. Sources of these metals include placement and removal of amalgam fillings (mercury, silver, copper, tin, and zinc) and disposal of the spent X-ray fixer solution (silver).^[1] The hazardous part of this waste presents physical, chemical, and/or microbiological risk to the general population and health care workers associated with handling, treatment, and disposal of waste.^[2]

The term “biomedical waste” (BMW) is defined as “any waste that is generated during diagnosis, treatment, or immunization of human beings or animals, or in the research activities pertaining

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to or in the production or testing of biological materials and includes categories mentioned in Schedule I of the Government of India's BMW (Management and Handling) rules 1998.^[3]

In July 1998, the first BMW rules were notified by the Ministry of Environment and Forest, Government of India.^[4] Later, the rules were amended by the Ministry of Environment, Forest and Climate change in March 2018.^[5] These new rules have increased the coverage, simplified the categorization and authorization while improving the segregation, transportation, and disposal methods to decrease environmental pollution. In dental as well as medical institute residents come across various types of cases and majority of these cases are treated by them. Thus, it is essential for them to be aware of BMW management and its potential hazards to avoid associated risks.

Considering this, a cross-sectional questionnaire study was conducted to assess the knowledge, attitude, and practices toward BMW management among residents of dental colleges of Davangere city.

MATERIALS AND METHODS

Study design and population

A cross-sectional questionnaire-based survey was conducted in March 2018. The total number of residents was 180 which included 100 from College of Dental Sciences (CODS) and 80 from Bapuji Dental College and Hospital (BDCH), Davangere, Karnataka. The study included 150 residents.

Pre-testing of the questionnaire

An e-questionnaire related to knowledge, attitude, and practices toward BMW management containing 15 closed-ended questions was prepared. A pilot study was conducted before administration of the questionnaire among 10 residents whose results were not included in the study (Cronbach's $\alpha = 0.81$).

Administration of questionnaire

Before the distribution of the questionnaire, the participants were informed about the importance of the study. Participants were included only on voluntary basis and links of the questionnaire were forwarded to them; the response rate of which was 83.3%.

Statistical analysis

The response from the participants was then computed into a Microsoft Excel worksheet and evaluated with the Statistical Package for the Social Sciences, IBM SPSS software version 22. Frequency distribution and Pearson Chi-square test were done to evaluate the statistical significance.

Table 1: Frequency distribution according to colleges.

Name of the college	Number of residents
College of Dental Sciences	85
Bapuji Dental College and Hospital	65
Total	150

RESULTS

Out of 150 residents, 85 residents were from CODS and 65 residents were from BDCH [Table 1].

The frequency distribution of the recorded responses along with the Pearson Chi-square test result is depicted in Table 2.

One hundred and forty-one (94%) residents thought that they were aware of BMW management, but only 90% of them chose the exact description of BM waste [Graph 1].

One hundred and seven (71.3%) residents knew correctly how long BM waste could be stored [Graph 1]. When residents were asked the correct symbol of biohazard, only a total of 41.3% could correctly identify the symbol [Graph 2].

On being questioned about the disposal of sharp objects, only 67 (44.7%) residents had the knowledge of its correct disposal [Graph 2].

When given multiple incorrect statements and a single correct statement on hazardous waste, 84 of 150 (56%) residents could correctly identify the correct statement that any type of container including food containers can be used to contain hazardous waste.

One hundred and twenty-nine (86%) residents felt that it was important to label the container before filling it.

Out of 150, only 50.6% of residents knew the correct color code for the disposal of human anatomical waste [Graph 3].

Out of 150, 70% of residents who agreed that storage of excess silver amalgam should be done in air-tight container [Graph 3].




It was also found that 121 (80.7%) residents dispose their X-ray film lead foils in separate waste container while 29 (19.34%) still continued to dispose lead foil in common bin and sewer [Graph 4].

Most of the residents (58.7%) said that they disposed their mouth masks and head caps in blue-colored container which is the correct protocol to be followed, whereas 41.3% of residents still disposed them incorrectly.

Only 34 (22.7%) residents knew the correct method of disposal of orthodontic wires and brackets.

The knowledge of the treatment of gypsum waste products was found to be in 97 (64.7%) residents while the rest had no knowledge of it [Graph 4].

Table 2: Frequency distribution of responses of Chi-square distribution.

Questions	Response	Frequency (%)	P value
Which statement describes BM waste	(a) Materials that may be poisonous, toxic, and flammable and do not pose disease-related risk	7 (4.7)	0.058
	(b) Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood	8 (5.3)	
	(c) 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 biological materials	135 (90)	
According to BM waste management rules, waste should not be stored beyond	(a) 24 h	27 (18)	0.543
	(b) 48 h	107 (71.3)	
	(c) 72 h	16 (10.6)	
What is the universally accepted symbol for biohazard	(a) 	62 (41.3)	0.93
	(b) 	71 (47.3)	
	(c) 	17 (11.3)	
Objects that may be capable of causing punctures or cuts that may have been exposed to body fluids; how should these be disposed of	(a) Black bag	36 (24)	0.64
	(b) Red bag	47 (31.3)	
	(c) Sharp container	67 (44.7)	
The color code for human anatomical waste such as extracted tooth and excised soft tissue is	(a) Blue	40 (26.6)	0.56
	(b) Yellow	76 (50.6)	
	(c) Red	34 (22.7)	
How do you store excess silver amalgam	(a) Air-tight container	105 (70)	0.33
	(b) Disposed to common bin	21 (14)	
	(c) Ceramic container with water	24 (16)	
How do you dispose X-ray film lead foils	(a) Common bin	10 (6.6)	0.59
	(b) Separate container	121 (80.6)	
	(c) In the sewer	19 (12.7)	
Gypsum waste products are	(a) Recycled	20 (13.3)	0.8
	(b) Incinerated	32 (21.3)	
	(c) Chemically treated	98 (65.3)	

BM: Biomedical

Ninety-two (61.4%) residents were aware that expired dental cement and medicines could be returned to the manufacturer instead of disposing them.

Finally, it was seen that only 89 (59.4%) of 150 residents knew that the final disposal of BM waste should be done by a separate licensed collector.

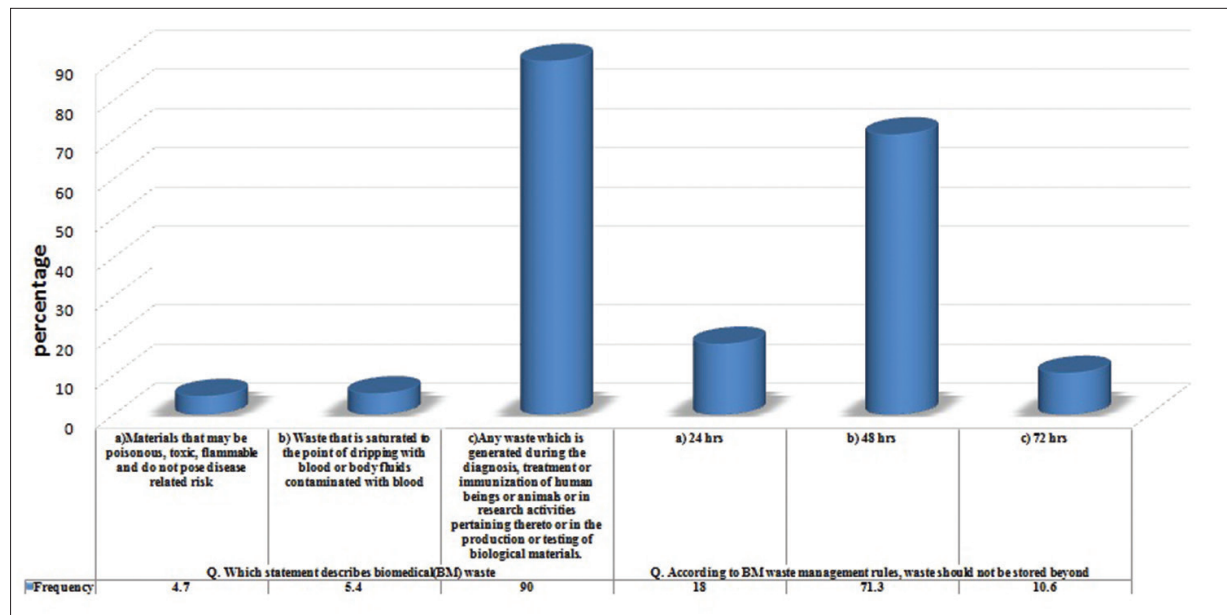
DISCUSSION

The waste created in the process of dental treatment is contaminated and it is a potential source of various infections and pollutants. According to the WHO fact sheet,

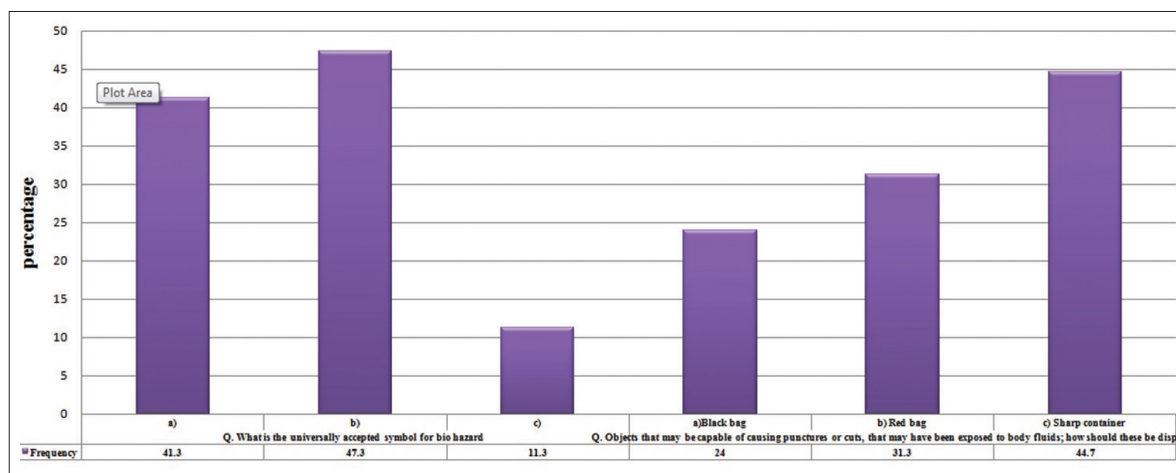
approximately 20% of waste generated by various health-care units is reported to be hazardous.^[6]

Waste generated in a dental teaching hospital is similar to that generated by other hospitals which include a large component of general waste and a smaller proportion of hazardous waste.^[7] Lacking the knowledge of management and possible hazards of BMW can affect general health status as well as the environment.

In the present study, 94% of residents said that they are aware of BMW management, but on observing the results of rest of the questionnaire, it was found that a large number of residents were not fully aware of the



Graph 1: Frequency distribution of responses (%).



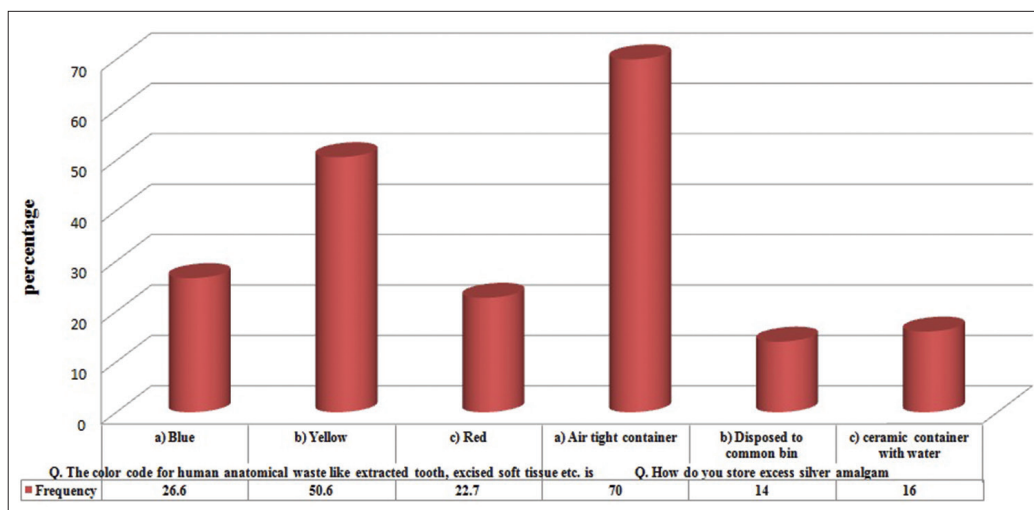
Graph 2: Frequency distribution of responses (%).

correct protocol. Similar results were obtained in a study conducted by Rajeev Ranjan *et al.*, in which it was found that 44% of the study populations were not aware of the management of BMW.^[8]

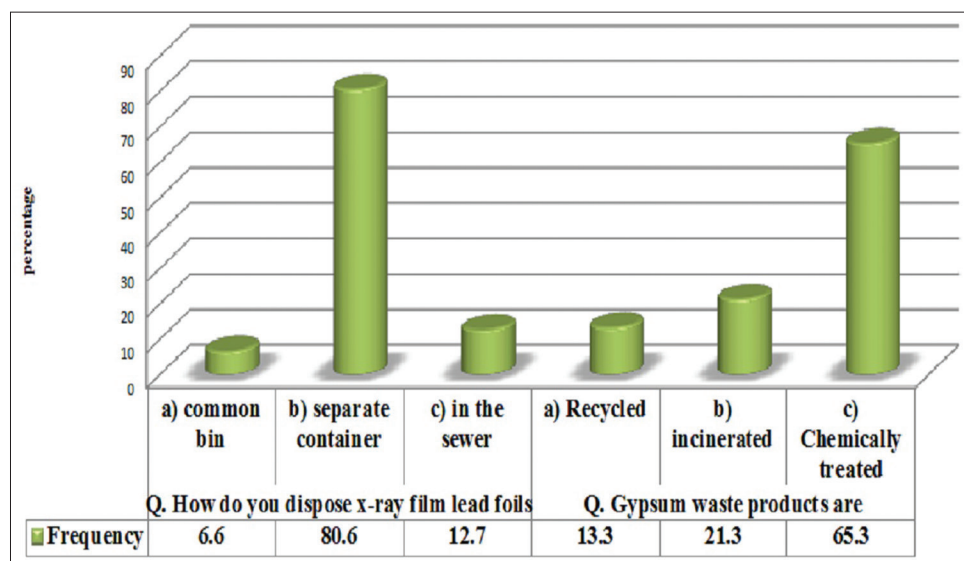
Adequate knowledge of the rules and regulations of the management of BMW waste is necessary to handle and dispose it. Knowledge regarding storage of BMW waste is essential as the infectious nature of the waste increases with storage for long hours.^[9] It was seen that 71.3% of residents knew about the duration of the storage of BMW waste but when asked about the universally accepted symbol of biohazard only 41.3% of residents could correctly recognize it. In contradictory to a study conducted by Kahar *et al.*, in which 82% of the total students could correctly recognize it.^[10]

Safe disposal of the objects which can cause puncture or cuts which are exposed to body fluids is crucial to avoid injuries and infections. Sixty-seven of 150 (44.7%) residents were aware of the disposal of sharps, whereas in a study conducted by Shah *et al.*, 35 of 135 (37%) were aware of the same, which is an alarming situation.^[11]

According to the BMW management rules, the segregation of waste is done according to the type of waste using different color-coded bags to improve categorization and disposal according to the category. When asked about the color code for the disposal of human anatomical waste, only 50.7% of residents were aware of it. In a study conducted by Chudasama *et al.*, 70.6% of participants knew the color code.^[12]



Graph 3: Frequency distribution of responses (%).



Graph 4: Frequency distribution of responses (%).

While manipulating various dental materials, many times some amount of material remains unused. Whenever possible the storage of the excess material should be done to avoid wastage and unnecessary burden of its disposal. When asked about the practice of residents to store excess amalgam, 70% of residents used air-tight containers, which was the correct practice. Whereas in a similar study by Sood and Sood, only 24% of dentists were using separate container to store it.^[13]

When asked about their practice of disposing used X-ray film lead foils, it was found that 80.7% of the total residents were disposing it correctly. Whereas in a study conducted by Kahar *et al.*, only 25% of participants were aware of the same.^[10]

It is estimated that 10–25% of health-care waste is hazardous, with the potential for creating a variety of health

problems.^[14,15] For waste management to be effective, the waste should be managed at every step, from acquisition to disposal.^[13,15]

Today’s residents are tomorrow’s practitioners. Thus, the right knowledge, a positive attitude and a good practice, will serve as guides to serve the patients.^[16,17]

CONCLUSION

From the current study, it can be concluded that the current knowledge and practices of residents show scope for improvement. There is a need to evaluate the method of educating dental students regarding the significance of the same, as occupational safety, infection control, and pollution control are of prime concern. As seen, from literature

review, it can be noted that BMW management is a common problem in many other health-care institutions in India; it is therefore absolutely necessary that the BM waste should be handled, segregated, and disposed of in a safe manner to protect the environment as well as human health. Thus, regular monitoring and training are required.

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Conflicts of interest

There are no conflicts of interest.

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