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KAP survey on dental waste management among dentists: A questionnaire based study

S. B. Divya, B. D. S.

Post graduate student, Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai – 600077

Email: divyasena03@gmail.com

M. S. Nivedhitha

Professor, Department of Conservative Dentistry and Endodontics, Saveetha Dental College, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai – 600077

Email: nivedhithamallisureshbabu@gmail.com

Abstract---Dental waste can be hazardous to humans and the environment. Care should be taken while disposing of clinical waste in order to protect and maintain the environment from contamination and ensure safety of those who come in contact with it. Aim of the study is to determine the awareness on knowledge, attitude and practice among dentists on dental waste management. A questionnaire-based survey was conducted. 203 questionnaires were distributed to dentists in and around Saveetha Dental College, Chennai. Data was collected and were tabulated, statistically analysed using SPSS software. Based on the study, it was found that 95.1% of the dentists knew protocol for waste management. However, only 55.2% sent amalgam waste to recycler, and 62.6% of the dentists rinse amalgam containing traps or containers in the sink. Based on the study we can conclude that though majority of the dentists were aware of waste management protocol and however almost half the number of dentists did not practice proper disposal of amalgam waste.

Keywords---KAP survey, dental waste, dentists, questionnaire based study.

Introduction

Dental profession has expanded considerably, leading to a significant contribution to the production of biomedical waste (BMW). Biomedical waste management is

the scientific disposal of BMW through segregation, collection, and treatment which enables decreased spread of infection. Biomedical waste management rules were put forth by the Ministry of Environment and Forest of Government of India on July 20, 1998, under the Environment Protection Act, 1986. Dental waste also contributes to hazardous biomedical (BM) waste. The various sources of dental waste materials like cotton, sharps, extracted teeth that are usually contaminated with body fluids like blood and saliva, lead containing films, amalgam waste etc. All these can be hazardous and can affect both the environment and the people. These Biomedical wastes are a threat to both mankind and the environment. Hence dentists must possess adequate knowledge about BMW management. A major issue with this dental waste management is that many hospitals dispose their waste in an improper way without proper segregation. This further adds to the difficulty in management of dental wastes and also spread of infections like hepatitis, HIV etc. The aim of the present study is to assess the knowledge, attitude and practice among dentists within Chennai city on Dental Waste Management.

Methods

A questionnaire based Knowledge, Attitude and Practice survey was conducted in Chennai city in and around Saveetha Dental College in December 2020. A total of 203 dentists gave consent and participated in the study. An initial self-structured, close-ended 25-point questionnaire was designed in English by assembling data through literature search. The questionnaire had 6 knowledge based questions, 6 attitude based questions and 8 practice based questions apart from the general demographic data of the participants.

Statistical analysis

The data were compiled and tabulated in Microsoft Excel spread sheet and were subjected to statistical analysis using IBM SPSS software version 23. All collected questionnaires were coded and analysed. The chi-square test is performed on it and level of significance was set on $p < 0.01$.

The questionnaire included the following questions

Demographic data present in the questionnaire included age, gender, speciality, Type of clinical practice, Number of years of clinical practice.

Knowledge based questions

- Do you know the protocol for waste management in dental practice?
 - a) Yes b) No
- Blood and other body fluid contaminated materials are disposed in
 - a) Red color coded bags
 - b) Yellow color coded bags
 - c) Blue color coded bags
 - d) Don't know
- Waste sharps are disposed in
 - a) Red bags

- b) Yellow bags
- c) White colored translucent puncture proof container
- d) Don't know
- Impression materials and infected cotton are included in which category of waste?
 - a) Solid waste
 - b) Soiled waste
 - c) Infected waste
 - d) Don't know
- What is the maximum storage time for Biomedical waste according to WHO protocol in tropical countries?
 - a) 24 hours during hot season, 48 hours in cool season
 - b) 48 hours during hot season, 24 hours in cool season
 - c) 72 hours during hot season, 48 hours in cool season
 - d) 48 hours during hot season, 72 hours in cool season
- Are you aware of Biohazard symbol?
 - a) Yes
 - b) No

Attitude based questions

- Do you think it is important to segregate dental waste from general waste?
 - a) Yes
 - b) No
- Do you think improper waste management can be hazardous to health?
 - a) Yes
 - b) No
- Do you think that infectious waste must be sterilized before disposal?
 - a) Yes
 - b) No
- Do you think it is important to label biomedical waste?
 - a) Yes
 - b) No
- Do you think that dental waste management and handling should be a compulsory part of curriculum?
 - a) Yes
 - b) No
- Whose responsibility is dental waste management?
 - a) Dentist and dental auxiliaries
 - b) Patient
 - c) No one

Practice based questions

- Do you rinse amalgam containing traps or containers in sink?
 - a) Yes
 - b) No
 - c) Sometimes
- Do you store dry dental amalgam waste in a designated, airtight container?
 - a) Yes
 - b) No
 - c) Sometimes
- Are your dental auxiliaries and house keeping staff trained to handle mercury containing material in a proper way?
 - a) Yes
 - b) No
 - c) Sometimes
- Do you send amalgam waste to a recycler?
 - a) Yes
 - b) No
 - c) Sometimes
- Do you follow mutilation of needles before disposal?
 - a) Yes
 - b) No
 - c) Sometimes

- Do you use color coded containers to dispose biomedical waste?
a) Yes b) No c) Sometimes
- Do you discard extracted teeth with amalgam directly into regular garbage?
a) Yes b) No c) Sometimes
- How do you dispose lead foil x ray films?
a) Separate and send for recycling
b) Dispose with regular waste
c) Dispose directly with other dental waste

Results

This study was conducted among 203 participants. 60.1% of the participants were of age group 20 to 30 years, 27.1% were of age group 31 to 40%, 9.4% of the participants were of age group 40 to 50 years, very few participants were above 50 years. 61.1% of the participants were females, 38.9% were males. 22.7% were general dentists, 27.1% of the participants were endodontists, 22.7% were post graduate in endodontics, 27.6% of the participants were of other specialities. 50.7% of the dentists who participated in the survey were from educational institute, 37.9% of the participants practiced in private, 11.3% of the dentists were from government sector. Majority of them, about 58.1% had clinical practice of less than 5 years, 27.1% of the participants had experience of 5 to 10 years, 11.8% of dentists participated had experience between 10 and 30 years. 95.1% of the participants knew the protocol for waste management, 62.6% of the dentists responded that blood and body fluid contaminated materials are disposed in yellow colour coded bags, 22.2% of them responded that it is disposed in red colour coded bags, 12.8% of the participants did not know in which colour coded bag, blood and body fluid contaminated materials are disposed. 66% of the participants responded that waste sharps are disposed in white coloured translucent puncture proof container 25.1% of the participants did not know how to dispose waste sharps.

75.4% of the participants knew the maximum storage time of biomedical wastes. 79.8% of the dentists felt it is important to segregate dental waste from general waste. 78.8% of the dentists felt that improper waste management can be hazardous to health. 69% of them think it infectious wastes must be sterilized before disposal. 90.6% of dentists think it is important to label biomedical wastes. 71.4% of dentists think dental waste management must be a compulsory part of curriculum. 37.4% of dentists still rinse amalgam containing wastes in sink. 75.5% of dentists store amalgam in designated air tight container. Only 55.2% of dentists send amalgam waste to recycler. Only 54.2% of dentists followed mutilation of needle before disposal. 88.2% of dentists use colour coded containers to dispose dental and biomedical wastes. Only 46.8% of dentists do not discard teeth with amalgam restoration directly into regular garbage. Still, 46.3% of the dentists dispose lead foil containing x ray films along with regular wastes.

KNOWLEDGE BASED ANALYSIS

Question	Options	Responses
Do you know the protocol for waste management in dental practice?	a) Yes b) No	95.1% 4.9%
Blood and other body fluid contaminated materials are disposed in	a) Red colour coded bags b) Yellow colour coded bags c) Blue colour coded bags d) Don't know	22.2% 62.6% 2.4% 12.8%
Waste sharps are disposed in	a) Red bags b) Yellow bags c) White coloured translucent puncture proof container d) Don't know	4.4% 4.5% 66% 25.1%
Impression materials and infected cotton are included in which category of waste?	a) Solid waste b) Soiled waste c) Infected waste d) Don't know	16.3% 12.3% 47.3% 24.1%
What is the maximum storage time for Biomedical waste according to WHO protocol in tropical countries?	a) 24 hours during hot season, 48 hours in cool season b) 48 hours during hot season, 24 hours in cool season c) 72 hours during hot season, 48 hours in cool season d) 48 hours during hot season, 72 hours in cool season	75.4% 14.8% 7.4% 2.4%
Are you aware of Biohazard symbol?	a) Yes	87.5% 12.5%

b) No

ATTITUDE BASED ANALYSIS

Question	Options	Responses
Do you think it is important to segregate dental waste from general waste?	a) Yes	79.3%
	b) No	1.5%
	c) May be	19.2%
Do you think improper waste management can be hazardous to health?	a) Yes	78.8%
	b) No	1%
	c) May be	20.7%
Do you think that infectious waste must be sterilized before disposal?	a) Yes	69%
	b) No	11.8%
	c) May be	19.2%
Do you think it is important to label biomedical waste?	a) Yes	90.6%
	b) No	4%
	c) Don't know	5.4%

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Do you think that dental waste management and handling should be a compulsory part of curriculum?

a) Yes	71.4%
b) No	2.5%
c) May Be	26.1%

Whose responsibility is dental waste management?

a) Dentist and dental auxiliaries	96.1%
b) Patient	1.9%
c) No one	2%

PRACTICE BASED ANALYSIS

Question

Options

Responses

Do you rinse amalgam containing traps or containers in sink?

a) Yes	6.4%
b) No	62.6%
c) Sometimes	31%

Do you store dry dental amalgam waste in a designated, airtight container?

a) Yes	75.9%
b) No	8.9%
c) Sometimes	15.3%

Are your dental auxiliaries and housekeeping staff trained to handle mercury containing material in a proper way?	a) Yes b) No	89.2% 10.8%
Do you send amalgam waste to a recycler?	a) Yes b) No c) Sometimes	55.2% 22.7% 22.2%
Do you follow mutilation of needles before disposal?	a) Yes b) No c) Sometimes	54.2% 5.4% 40.4%
Do you use colour coded containers to dispose biomedical waste?	a) Yes b) No c) Sometimes	88.2% 6.4% 5.4%
Do you discard extracted teeth with amalgam directly into regular garbage?	a) Yes b) No c) Sometimes	18.7% 46.8% 34.5%

How do you dispose lead foil x ray films?	a) Separate and send for recycling	43.3%
	b) Dispose with regular waste	10.3%
	c) Dispose directly with other dental waste	46.3%

Test Statistics

	Type of Clinical Practice	Do you know the protocol for waste management
Chi-Square	54.070 ^a	164.970 ^b
df	2	1
Asymp. Sig.	.000	.000

a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 66.7.

b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 101.5.

Discussion

The safe and effective management of biomedical waste is not only the responsibility of every clinician but is also social and legal responsibility of every individual who support and also take support from health care system. Effective biomedical and dental waste management is very important for healthy humans and cleaner environment. Many international agreements and conventions have been held in this regard and signed by most of the countries. In India, In July 1998, first biomedical waste management rules were notified by Government of India, by Ministry of Environment and Forest. These rules have been modified in the years 2000, 2003, 2011. The latest is the biomedical waste rules 2016. According to this, the scope of rules have been expanded considerably, the use chlorinated plastic bags, gloves, blood bags etc. should be gradually stopped, use of barcode system for disposal, liquid waste to be separated at source and pretreated before disposal. In our study, 95.1% of dentists were aware of protocol for dental waste management. 66% of the dentists knew how waste sharps are supposed to be disposed. This is similar to the results obtained by Narsimha Lakshmi et al. (66% of the dentists knew waste sharps disposal) and almost similar to Jamkande et al. According to the author 71% of the dentists knew the

proper disposal of waste sharps. Improper disposal of used sharps can cause hazardous needle prick infections like Hepatitis B, HIV etc. They must be disposed in a white translucent puncture proof container.

Almost 80% of the dentists felt it is important to segregate biomedical wastes. This is a very important thing to follow because each type of waste has different method of disposal. In order to follow the proper and effective disposal method, it is of utmost importance to segregate these wastes at the source itself and send for disposal. 90.6% of the dentists in our survey think it is important to label biomedical wastes. In a way labelling makes the segregation easy and thereby the management of the wastes would be easier. In our study, 71.4% of the dentists strongly said biomedical waste management and programs must be important part of curriculum. Santhosh Kumar et al. in their survey said about 80% of the dentists wanted biomedical waste management and programs in their curriculum. Every dentist must be educated in this regard for the welfare of the environment and the people.

According to our study, around 37% of the dentists still follow improper method to dispose amalgam wastes. This is similar to survey conducted by Narasimha et al. where in 53.2% still dispose amalgam wastes in common bin. Though amalgam usage has come down considerably in the recent past, owing to the availability of newer types of amalgam restorations like bonded amalgam restorations, still amalgam is used in dentistry. So, protocol for mercury spill and amalgam waste management must be known to every clinician and should be followed in practice. Also according to our survey, only 55.2% of dentists sent amalgam waste to recycler. According to Ashika et al. Maximum number of Dental practitioners (69.2%) reported that regular dust bins were not being used by them. Silver fillings were not being flushed in the drain by 97.3% of the dentists. It is very important that amalgam must be recycled as improper disposal can cause heavy metal poisoning in the environment. In our study, only 54.2% of the dentists follow mutilation of needles before disposal. About 10 to 20% of the needle stick injuries happen during disposal, making proper management essential.

88.2% of the dentists used colour coded bags for disposal. According to Jhamkandhe et al. it was 79.2%. According to Pawan Pawar et al, 85.4% of dentists followed colour coding in waste management. According to Ashmika et al, only 60.2% of the dentists followed colour coding for waste management. This is an important part as colour coded bags can be easy to identify and segregate type of waste and thereby help in easy and effective disposal of biomedical wastes. In our study, 53.2% of dentists disposed extracted teeth directly with regular waste. This is in accordance with Amol et al. in which 70.2% of dentists disposed extracted teeth along with regular wastes. According to Ashika et al, 51% of dentists disposed extracted teeth with regular waste. In our survey majority of the dentists, about 95.1% answered that they knew protocol for waste management but in spite of that in practice a huge percentage of the dentists did not follow proper and safe measures for disposal.

In this study, disposal of lead containing foils in X ray films was also questioned. Only about 43.3% of them separated and sent for recycling. This result is similar

to that by Jhamkande et al. in which 43.8% of the dentists only sent lead foils to recycler. Based on statistical analysis, it was significant ($P < 0.01$) that majority of the endodontists, post graduates, general dentists and dentists belonging to other specialties wanted biomedical waste management to be compulsory part of dental curriculum. Also It was statistically significant ($p < 0.01$) that dentists pertaining to different sectors of practice like educational sector, private and government sector, about 88% (33% in private, 45.5% in educational and 9.5% in government sector) of them followed colour coded bags for waste disposal.

Proper disposal of BMW is a social responsibility. It is the one of the most necessary and important social issue to be handled by the government and the doctors. A combined approach by government, dentists and auxiliaries can solve the issue. Educational and motivational training programs should be conducted. Furthermore, undergraduate and post graduate curriculum should definitely have waste management as part of curriculum. This topic along with practical demonstration classes on waste disposal should be considered. Knowledge is the basic criterion that allows one to distinguish between right and wrong. Attitude allows one to thinking towards a proper situation and direction. Practice is the actual application of the acquired knowledge and gained attitude. A right knowledge, a positive attitude and putting all these into practice by every clinician can lead to a path of effective and non hazardous management of biomedical wastes.

Conclusion

Based on the study conducted, we can say that majority of the dentists knew protocol for waste management but many of them lack proper attitude and practice in dental waste management. Awareness concerning management of various kinds of biomedical wastes among dentists needs to be promoted in a better way which will lead to reduction in the harmful consequences of ill-disposed hazardous waste. Safe and effective management of waste is not only legal necessity but also a social responsibility. Dental waste management must be an important part of curriculum and every graduate must be trained well on waste management. It is the duty of every clinician to follow proper biomedical waste disposal system.

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