Caspian Journal of Dental Research
e-ISSN: 2322-2395 p-ISSN: 2251-9890

# Knowledge and practice regarding dental radiological waste disposal among dental specialists and general dentists in Amol and Babol cities

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**Article Type**

**Short Communications**

**Received:** 16 Oct 2021
**Revised:** 13 Feb 2022
**Accepted:** 16 Mar 2022

## ABSTRACT

**Introduction:** The aim of this study was to assess dentists' knowledge and practice about dental radiological wastes that are dangerous to the environment.

**Materials &Methods:** This cross-sectional study was conducted in 2018-2019. All participants completed a two-section (knowledge and practice) checklist. Data were analyzed using descriptive statistics, t-test and ANOVA. A value of $P<0.05$ was considered significant.

**Results:** Totally, 204 (73.5% general dentists and 26.5% specialists) dentists from Amol (35.8%) and Babol (64.2%) participated. The mean age of participants was 39.2 (SD± 10.9) years, and 59.2% of them were female. The average percentage of dentists' knowledge and practice about radiological waste disposal was 42.55 and 43.12% respectively. Gender, work experience, special or general degree and city of clinical activity had no significant effect on dentists' knowledge and practice ($P>0.05$).

**Conclusion:** More than half of dentists had no correct knowledge and practice on how to dispose of radiological wastes. It is necessary to develop specific approaches such as workshops and training classes.

**Keywords:** Medical Waste Disposal, Knowledge Bases, Dentist's Practice Patterns

**Cite this article:** Ahmadpour S, Johari M, Naghibi Sistani MM. Knowledge and practice regarding dental radiological waste disposal among special and general dentists in Amol and Babol cities. Caspian J Dent Res 2022; 11(1): 64-8.

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## Introduction

The first step in improving dental waste management is to be aware of the current situation and the way of management in this field.[1] Although a huge amount of solid and infectious wastes were produced in the dental offices (general dentists and specialists' offices) of Babol [2], the status of waste management in dental centers showed that more than two-thirds of dental centers in other Iranian cities had no active plan to reduce waste production[1] or had no proper management for disposal of dental radiology waste in offices.[3]

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[ DOR: 20.1001.1.22519890.2022.11.1.4.0 ]
[ DOI: 10.22088/cjdr.11.1.64 ]

Some possible reasons include lack of dentists' knowledge about management and control of medical wastes rules, lack of dentists' interest and efforts for improving the level of knowledge and study of the latest research in toxic substances and compounds in dentistry and their lack of attention to environmental health. [4]

Since, data about dentists' knowledge of recognizing different types of radiologicalal wastes and how to separate, dispose or recycle them in Iran are scarce, the aim of the current study was to assess the knowledge and practice of general dentists and dental specialists about the disposal of dental radiology waste in Amol and Babol and to assess the factors related to this knowledge and practice.

## Materials &Methods

This cross-sectional study was conducted on general dentists and dental specialists who worked in Amol and Babol in 2018-2019. The sample size was measured by $n = \frac{N(Z1-\alpha½)2\times pq}{Nd2+(Z1-\alpha½)2\times pq} = 201$, Pwas measured as 0.5. All 204 dentists (131 from Babel and 73 from Amol) completed a two-section checklist. The census method of sampling was used in the present study.

The checklist comprised seven items related to knowledge, six items related to performance on how to dispose of dental radiology residues (used and non-used fixed bath (solution), used and non-used emergence solution, film package stained with blood and saliva, lead sheet inside the envelope radiographic film), and two items about the amount of waste produced in the offices. The relevancy, clarity and necessity of the checklist's items were checked by an expert panel including three radiologists, one endodontist and one epidemiologist before sampling.

For statistical analysis, correct and incorrect answers were scored one and zero, respectively. The overall knowledge score was ranged from 0 to 7, and the practice score was ranged from 0 to 6. Answering more than 70% of the items correctly indicated good knowledge and practice. The association between demographic characteristics of the studied dentists and their knowledge and practice was assessed using independent t-test and ANOVA. A value of $P<0.05$ was considered significant. All data were analyzed using SPSS 22.

This study was approved by the Ethics Committee of Babol University of Medical Sciences, Babol, Iran with the code of IR.MUBABOL.HRI.REC.1397.162. Participation was voluntary. Moreover, a brochure about the type of radiological wastes and their proper disposal management was provided and gifted to the participants.

## Results

Demographic characteristics of the studied dentists represented that totally, 204 (96 (47.1%)=males, 108 (52.9%)=females) dentists participated in the current study. The mean age of the subjects was 39.2 (SD10.96) years. Dentists consumed 47 films on average per month. In all, 50 (53.8%) dentists used less than half a liter of developer and fixer, 34 (37%) applied between half to one liter of developer and fixer and 8 (8.7%) utilized more than one liter of developer and fixer per month.

Among all, no one answered correctly to all items of knowledge and practice checklist. Five dentists answered all knowledge questions correctly, and one answered all practice questions correctly. The average percentage of dentists' knowledge and practice about radiological waste disposal was 42.55 and 43.12% respectively.

The frequency of dentists' correct answers to the knowledge and practice about dental radiology waste disposal is represented in table 1. In the field of knowledge, the first three questions that had the highest frequency of correct answers were: "what kind of waste is the film package stained with blood and saliva?" (78.9%), what kind of waste is the toxic substance of the fixer solution (53.9%) and what kind of waste is the lead foil inside the film pocket (49%).

While the highest frequency of incorrect answers to the knowledge questions was: the type of waste of used developer solution (84.3%), the type of waste of non-used fixer solution (64.7%) and the type of waste of non-used developer solution (60.8%). In terms of practice, the first two questions that had the highest frequency of correct answers were: how to dispose of used developer solution (9.85%) and how to dispose of impregnated film pocket and

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bitewing tab with blood and saliva (55.4%). The highest frequency of incorrect answers to practice questions was: how to dispose of used fixer solution (78.3%) and how to dispose of non-used developer solution (77.2%).

There was no statistically significant relationship between knowledge and radiologicalal waste management practice score with gender, work experience, professional degree and city of clinical activity (P > 0.05).

**Table 1. Frequency of dentists' correct answers to both knowledge and practice of how to dispose of radiological waste (n=204)**

| | Knowledge questions | Correct Frequency(%) | Incorrect Frequency(%) |
|---|---|---|---|
| 1 | What kind of waste is the used developer? | 32(15/7%) | 172(84.3%) |
| 2 | What kind of waste is the unused developer? | 80(29%) | 124(60.8%) |
| 3 | What kind of waste is the used fixer? | 93(45.65) | 111(54.4%) |
| 4 | What kind of waste is the unused fixer? | 72(35.3%) | 132(64.7) |
| 5 | What is the type of toxic substance in the fixer? | 110(53.3%) | 94(46.1%) |
| 6 | What kind of waste is the film package stained with blood and saliva? | 161(78.9%) | 43(21.1%) |
| 7 | What kind of waste is the lead sheet inside the radiographical film envelope? | 100(49%) | 104(51%) |
| | Practice questions | Correct Frequency(%) | Incorrect Frequency(%) |
| 8 | How do you dispose of the used developer in your office? | 175(85.9%) | 29(14.1%) |
| 9 | How do you dispose of the used developer in your office? | 47(22.8%) | 157(77.2%) |
| 10 | How do you dispose of the used fixer in your office? | 45(21.7%) | 159(78.3%) |
| 11 | How do you dispose of the unused fixer in your office? | 51(25%) | 153(75%) |
| 12 | How do you dispose of the film package stained with blood and Saliva in your office? | 113(55.4%) | 91(44.6%) |
| 13 | How do you dispose of the lead sheet inside the radiographical film Envelope in your office? | 98(47.8%) | 106(52.2%) |

## Discussion

The results of the present study suggested that more than half of the studied dentists had improper knowledge and practice in the field of radiological waste disposal. Dentists had the least knowledge in identifying the type of developer and fixer waste. Moreover, more than two-thirds of dentists had no necessary knowledge about the correct disposal of developers and fixers in the office.

Similarly, half of the dentists in Bandar Abbas threw lead foils in the trash and dumped solutions of radiology film preparation directly into urban sewage. [5] In addition, the results of Danaei et al.'s study in Shiraz demonstrated that in terms of knowledge level, less than half of dentists considered radiological waste as household waste, and almost half of them did not consider radiological waste as hazardous waste, representing the low level of knowledge of dentists. [6]

The results of a study conducted in Sao lui, Brazil revealed that almost all dentists believed that radiological waste could harm the environment, while less than half of them disposed of these wastes properly.[7] The Health and Medical Waste Management Committee of Sao luis had prepared advertising posters on the dangers of medical waste and installed them in dental clinics. This shows the tremendous impact of education on dentists' positive attitudes toward waste management. However, improper practice results indicate the lack of necessary instructions and rules in the field of radiological waste disposal. [7]

Similar to our findings, a review of oral radiology safety standards among dentists in several cities in Iran illustrated that there was no difference between the practice of dental specialists and general dentists in the field of radiological

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waste disposal. In general, out of one thousand cases, only three percent of dentists had the correct practice in the field of radiological waste disposal. [8]

Although participating actively in reeducation courses for women dentists [9], less experienced dentists as well as specialized dentists [10] is effective, dental waste management courses are not held regularly for Iranian dentists, and the reeducation courses that have been held so far in Amol and Babol have not addressed such an issue, unfortunately.

The health sector should monitor dental offices and clinics regularly and provide information on the proper management of waste disposal using reeducation programs. Furthermore, it is necessary to pay more attention to the dental wastes in the environment and include this issue in the dentistry curriculum.

## Conclusion

The results of the present study showed that more than half of dentists regardless of their specialty, gender, job experience and office city had no correct knowledge and practice in radiological waste disposal. Dentists suggested the least knowledge in identifying the type of developer and fixer waste and had the worst practice on how to dispose of developer and fixer wastes in the office.

## Acknowledgments

The authors gratefully acknowledge Hemmat Gholinia for analyzing the collected data and all persons who participated in this study.

## Funding

This study was a research project (Grant no: 9706273), supported and funded by Babol University of Medical Sciences.

## Conflicts of Interest

We declare no conflict of interest.

## Authors' Contribution

The study was designed by Mohammad Mehdi Naghibi Sistani, Shakiba Ahmadpour and Maryam Johari. The study data were collected by Shakiba Ahmadpour. Analysis and interpretation of data were performed by Mohammad Mehdi Naghibi Sistani. The article was written by Mohammad Mehdi Naghibi Sistani, Shakiba Ahmadpour and Maryam Johari. Study supervision was conducted by Mohammad Mehdi Naghibi Sistani.

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