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Research Article

THE SURVEY OF DENTAL WASTE QUANTITY, QUALITY, AND MANAGEMENT OF 4 DENTAL CLINICS IN TEHRAN

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ABSTRACT
Dental wastes are one of the environmental issues which are of great importance due to having hazardous, toxic, and pathogenic agents such as infectious, medical, chemical, and toxic wastes. Properly managing and monitoring the practices of separation, collection, storing, transportation, and disposal of such hazardous materials are necessary for the safety of patients, personnel (dentists, nurses), and also other referees to the dental clinics. The objective of this study is to determine the quality, quantity, and management of dental wastes in 4 dental clinics in Tehran. In this cross-sectional descriptive study, the population consisted of 4 dental clinics in west, center, east, and north of Tehran. Three samples were taken from each unit over a period of 2 months; at the end, 195 samples were totally selected. Then, the wastes were manually segmented and divided into 36 components and using a laboratory scale, they were weighted with the precision of 100 grams. In the next step, in order to examine the current situation and the implementation process of hazardous dental waste management and also to collect data using review, observation, and checklist techniques which included 54 questions, the current situation and waste management practice in these clinics were examined by the researcher, which included steps such as generation, separation, storing, collection, and disposal; the results were analyzed using descriptive statistical techniques. According to the obtained scores, management quality of 3 clinics was proved to be at an average level and only clinic 4 was perfectly managed. The per capita percentage for the infectious waste part except for clinic 1, which was 50%, was 48%. The per capita percentage for chemical and medical waste part except for clinic 1, which was 36%, was 48%. This amount for toxic waste part for each clinic was 13%. The mean per capita for the infectious waste per person per day was (187.09 ± 9.81) for the toxic waste part and (48.38 ± 1.4) for the chemical and medical section. Considering the existence of different types of materials with different components and various features in dental wastes, their optimal management must be done based on their specific features which includes plans for the reduction of waste generation, segmentation, separation, and recycling.

Keywords: *Toxic Wastes – Dental Waste – Hazardous Waste- infectious was*

INTRODUCTION
The expansion of cities, the increase of population, industrial developments, and the increase of waste generation per capita have turned the problem of waste collection, transportation, and disposal into an important and complex one which requires a regular system of rule application. The issue of proper waste collection and disposal is of great significance due to its direct and indirect hazards for the health of human beings, animals, plants, and the environment (Centers for Disease Control and Prevention, 2001). On one hand, the fast growth of population and the increase of health care needs of human communities have contributed to the expansion and development of different health care centers such as hospitals, clinics, and governmental and private laboratories in the world which itself has increased medical waste generation (Tchobanglous and Theisen, 1996; Omrani and Alavi, 2008). Medical wastes are one of the main problems in waste management in urban societies in developing countries. The combination of these wastes with urban wastes endangers the environment and the people having contact with such materials

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(Tsakona *et al.,* 2007). Depending on their type and generation source, solid wastes have different quantitative and qualitative features. In order to correctly plan waste management, one must be aware of their type, generation source, and quantitative and qualitative features (Birpinar and Erdogen, 2009).
Dental clinics and offices are one of the generation sources of such wastes (Wong and Kashyap, 1999). Dental wastes are one of the environmental problems which are of great significance due to their hazardous, toxic, and pathogenic agents such as pathologic, medical, chemical, toxic, and infectious wastes and sharp objects. Although these centers generate relatively low amounts of wastes, due to the increase of referees to such centers in the last decade and the use of single-use tools and gloves, the quantity of the generated wastes has been increased and their quality has been changed. In most countries, medical waste rules cover dental wastes. Each rule related to dental waste management can totally and partially include many elements. Such elements can be divided based on hazardous potential, generation source, management type, and other available parameters. Based on features such as hazardous potential and environmental importance, dental wastes include pseudo-domestic, infectious, chemical, medical, and toxic wastes. Nonhazardous wastes include wastes which do not contain hazardous materials for the health of human beings, animals, or the environment. This part of dental wastes can be collected and disposed of along with other ordinary and regular urban wastes. Besides, this part can also be recycled. These elements include paper, food materials' plastic bags, glass, and metals. Dental hazardous wastes include solid or semi-solid materials with a hazardous potential (Arenholt-Bindsler, 1998; La-Grega *et al.,* 2001; Fan and Mc-Gill, 1989). Dental offices generate a low amount of hazardous wastes. Some of such hazardous wastes can be recycled, too. Dental hazardous wastes include amalgam, x-rays films, lead foils, drug residue, and unconsumed chemical materials (Trip, 2001). Today, waste management, especially hazardous waste management, is done based on preventive methods and generation reduction, environmentally friendly practices which guarantee the health of employees of such centers. Lack of attention to this can cause severe damages to the employees and patients of such centers. The objective of this study is to determine the quality, quantity, and method of dental waste management in 4 clinics in Tehran.

MATERIALS AND METHODS

The present research is a cross-sectional descriptive study. Sampling was done in 4 dental clinics in north, center, west, and east of Tehran which offered specialized dental treatments, pediatric orthodontics, restoration, and oral and maxillofacial surgery. These 4 clinics were selected based on the number of patients and the variety of the offered specialized dental treatments, geographical location, economic situation, and population rate in comparison with other centers. The number of the selected samples from each clinic was equal to the number of all the units of that clinic. From each three unit, 3 samples were selected during 2 months; totally speaking, 195 samples were selected. In order to calculate the hazardous waste generation mean per capita before sampling, the steps regarding the necessary coordination between the clinics' managers were taken and the dentists, their assistants, and service section workers were explained about the present research. Then, the generated wastes were segregated and collected (such that regular infectious wastes were placed in orange plastic containers; infectious wastes with sharp objects were placed in safety boxes; and chemical, medical, and toxic wastes were placed in brown containers and in special occasions in their special containers). It was attempted to physically analyze the samples up to 4 hours after sampling (weighting by a scale). The used scale in this study was model EK120A of the digital laboratory scale with a precision of .01 grams. To do so, the waste sample was manually segregated at first and divided into 36 components; then, using this laboratory scale, these components were weighted. For more safety during separation and weighting operations, personal protective equipment and instruments such as uniforms, shoes, gloves, masks, glasses, and caps were supplied and delivered to the service section workers. Each component was weighted three times and eventually, the obtained mean value was applied to each component. The obtained value shows the generation rate of different waste components at the end of workdays for each unit. Furthermore, the number of the referees to each unit was also determined at each workday in order to obtain waste

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generation per capita for each patient and unit based on it and also the total generated wastes. Dividing the daily generated waste over the number of referees and the number of units, the waste generation per capita for each patient in each workday was obtained. Having been collected, the data was analyzed using Excel Software. In order to collect data, observation, review, and checklist techniques were used. The checklist included 54 questions in 6 parts such that each part had its own particular score. The obtained scores are as below: waste-related management and employees (24 points), segregation, labeling and collection (64 points), storing (14 points), transportation (16 points), segregation and recycling the chemical and toxic materials (40 points), and immunization (14 points). The current situation and the implementation of waste management in clinics were investigated in terms of generation, segregation, storing, collection, and immunization by the researcher. The reliability of the used checklists has been calculated and they have also been confirmed by environmental health experts. Checklists were used according to article 11 of the state waste management law approved in 2004 regarding the regulations and practices of medical waste executive management and also the announcement of Ministry of Health and Medical Education of the country. For each question of the checklist, according to its value and importance, at most 2 points have been assigned; the score of each question ranges between 0 to 2, which is defined as below:

If the checklist question was in line with waste management regulations for more than 90%, that question would receive the full score.

If the question was in line with waste management regulations between 75% to 90%, it would receive 1.5 of 2.

If the question was in line with waste management regulations between 50% to 75%, it would receive 1 of 2.

If the question was in line with waste management regulations between 25% to 50%, it would receive 0.5 of 2.

If this consistency was less than 25%, it would receive the score of zero.

Then, the score of each question was multiplied into its weight and eventually, the total score of each question and the total score of the checklist were calculated. Investigating the consistency level of each question in the clinics by relying on the consistency with the waste management law, the results obtained from the checklists were analyzed and the management level was reported based on the obtained score by each clinic in the undesirable area (contrary to the waste management law) as weak, average, and good (in accordance with the waste management law); eventually, the proper management pattern was suggested.

RESULTS AND DISCUSSION

Findings

As can be seen in Figure 1 which is related to infectious, chemical, medical, and toxic wastes to all the generated waste in clinics 1-4, the most amounts are respectively related to the infectious part (more than 50% in all clinics), chemical, medical part (27-36%), and toxic part (close to 12%). The most amount of infectious waste is in clinic 1 (5272.07 gr); the most amount of the chemical and medical waste is generated in clinic 2 (2304.03 gr); and the most amount of toxic waste is generated in clinic 1(980.05 gr).

Figure 2 shows the infectious, chemical and medical waste per capita in relation with all the generated waste in the 4 clinics under the study. In all cases except for clinic 1 (51%), the infectious waste per capita is 48%. The infectious waste per capita mean is 187±9.81 grams. The chemical and medical waste per capita for all clinics except for clinic 1 (36%) is 39%. The chemical and medical waste per capita mean is 147±4.33 grams. The per capita percentage for the toxic part in all clinics is 13% with the weight mean of 48.38±1.4 grams.

Table 1 shows the total generated waste in clinics 1-4 based on each unit in the form of percentage and weight mean. The most amount of the generated infectious materials by each unit in a day is produced in visits, extraction, and scaling with 31% (395.14± 92.19 gr); then, orthodontics and prosthesis with 28% (354.77±184.58 gr) are placed.

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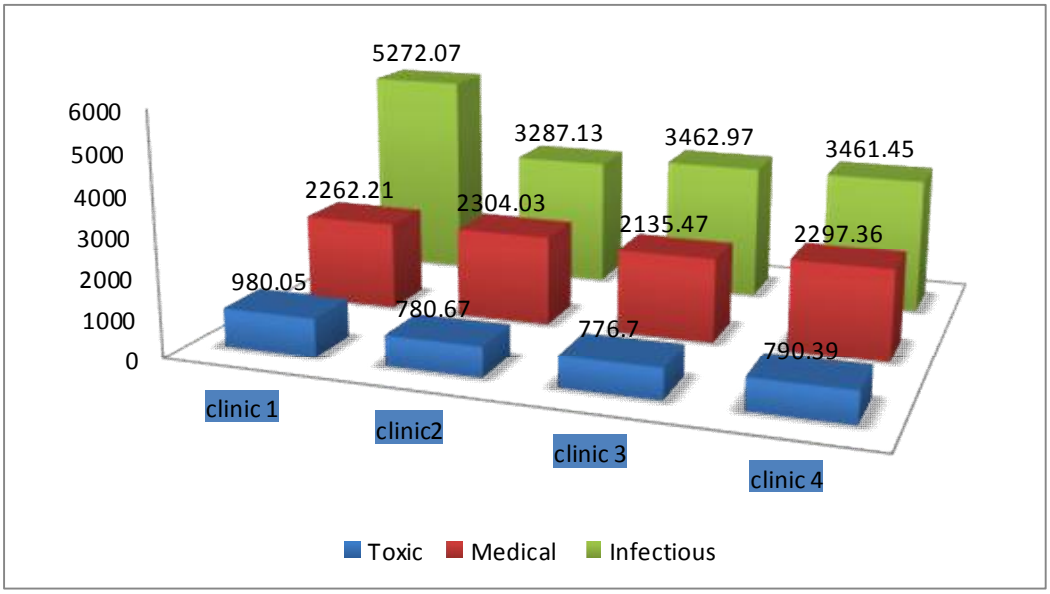

Figure 1: The Infectious, Chemical, Medical, and Toxic Wastes in relation with All the Generated Waste in clinics 1-4 based on the Amount (gram) and Percentage

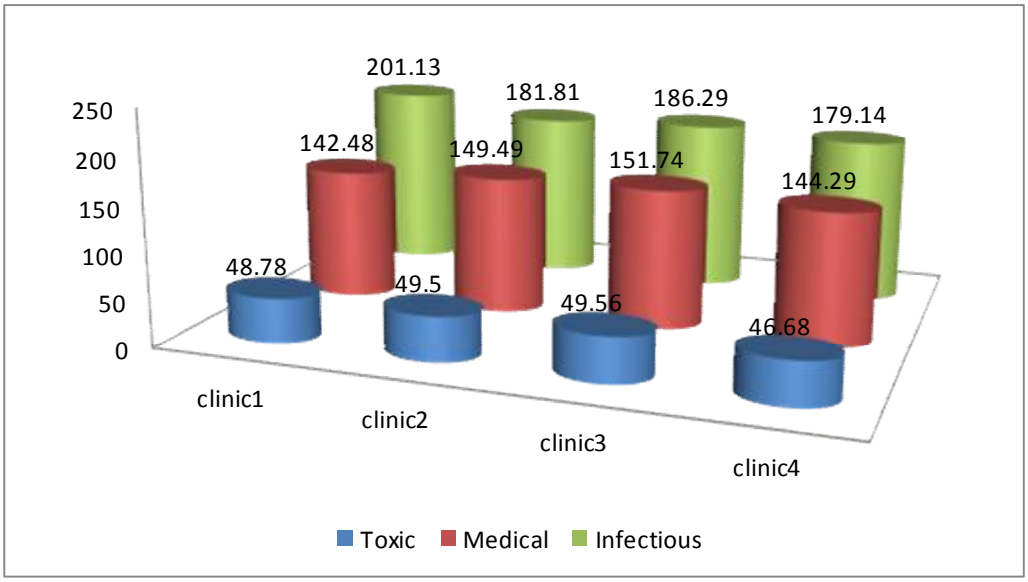

Figure 2: The Infectious, Chemical, Medical, and Toxic Waste Per Capita in Relation with all the Generated Waste Materials in Clinics 1-4 per Person based on the Amount (gr) and Percentage

Table 1: The Infectious, Toxic, and Medical Waste Mean Generated in all Units in all Clinics

Section	The Infectious Waste Mean		The Toxic Waste Mean		The Chemical and Medical Waste Mean	
	Gram	Percent	Gram	Percent	Gram	Percent
Restoration	85.0375	7	62.7675	25	3.395	0
Visit, Extraction, Scaling	395.14	31	63.1675	25	7.255	1
Endodontic Therapy	193.9225	15	90.6575	36	4.97	0
Orthodontics and Prosthesis	354.775	28	8.9275	3	1277.7425	98
Surgery	247.775	19	26.6625	11	6.1175	1

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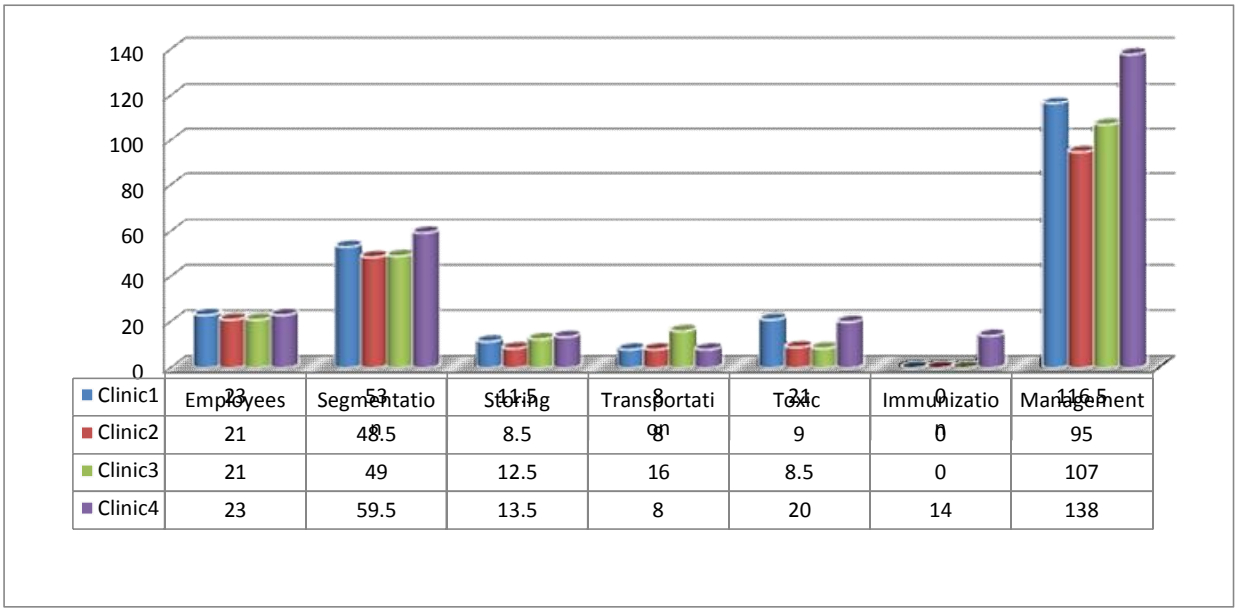
The per capita mean of the unit's toxic part in a day for the endodontic therapy is 36% (90.16±17.27 gr) which is the most amounts among the other offered treatments. After that, extraction and scaling with 25% (63.16±17.27 gr) have the most amounts. About 98.3% (1277.74 gr) of the chemical and medical part is generated in the day of orthodontics and prosthesis.

Figure 3 shows the waste management level in clinics (waste-related management and employees, segregation, labeling and collection, storing, separation, transportation, and recycling of chemical and toxic materials, and immunization).



	Employees	Segmentatio	Storing	Transportati	Toxic	Immunizatio	Management
Clinic1	23	53	11.5	8	21	0	116.5
Clinic2	21	48.5	8.5	8	9	0	95
Clinic3	21	49	12.5	16	8.5	0	107
Clinic4	23	59.5	13.5	8	20	14	138

Figure 3: The Total Situation of Waste Management in the Clinics

As can be seen in Figure 3, the total score of the employee section was 24 points; in this regard, clinics 1 and 4 obtained the highest scores. In all clinics, waste-related managers and employees have become aware of the instructions and the workers have also been trained. Besides, workers' health has been controlled through periodic tests and building health records. Immunization against diseases has been achieved through vaccination and workers have also been provided with personal protective equipment; this part is in consistency with the waste management law.

The total score of the segregation part is 64 points; in this regard, clinic 4 has the highest score. In all clinics, the situations of segregation and collection seem to be proper and clinic 4 has a better situation in comparison with other clinics; in all clinics, infectious wastes are separated and standard, healthy, sealed, anti-rust, washable, and pedal containers are used.

Infectious wastes are stored in containers with yellow bags and sharp objects are discarded into the safety boxes. The non-agreement in this part is not labeling the waste features in clinics 1, 2, and 3; it is only done in clinic 4.

The total score of the storing part is 14 points; in this regard, clinic 4 has the highest score. The situation of storing in clinic 4 is better than other clinics. All clinics have places to temporarily store wastes and they all use standard and hygienic containers. Furthermore, the hygienic situation of such places is also in line with the waste management law.

The total score of the transportation part is 16 points; in this regard, clinic 3 has the highest score. Wastes are hygienically transported from inside the parts only in clinic 3; this is done manually in other clinics. Waste transportation to outside of the clinics is done by special municipal service cars which have signed contracts in waste transportation part. The non-consistency in this part is the non-possession of waste transportation trolleys in clinics 1, 2, and 4; this is manually and unhygienically done which endangers transportation workers.

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The total score of the toxic and chemical material recycling part is 40 points; in this regard, clinic 1 has the highest score. The situations of separation and recycling of chemical and toxic materials in clinics 1 and 4 are better than those of clinics 2 and 3. The non-consistency in this part is the non-recycling of amalgam, amalgam capsules, collection and recycling of the extracted teeth containing amalgams after disinfection, and the non-equipment of the units with amalgam filtering.

The total score of the immunization part is 14 points; in this regard, clinic 4 has the highest score. Immunization is only done in clinic 4 and not in other clinics; this is not in agreement with the waste management law. In clinic 4, in order to immunize, the non-flame method is used; infectious wastes and those with sharp objects become immunized. Furthermore, the evidence related to microbial monitoring and the proper performance of the immunizing instruments also exists.

The total situation of the waste management in clinics under the study in Figure 3 shows that clinic 4 with the score of 138 points is at a good management level. Besides, management situation in clinic 1 has obtained the score of 5.116 points which is an average level. Clinic 3 has also the score of 107 points which shows an average management level. Clinic 2 has the score of 95 points which shows an average management level; this is weaker than other clinics in terms of management method.

Discussion

Regarding the infectious waste generation, infectious waste per capita except for clinic 1 (51%) was 48% for other clinics. The amount of waste generation in clinic 1 was approximately in line with the results obtained by Koolivand *et al.,* (2009) in dental offices in Hamedan (51.93%); besides, it was also in line with the results obtained by Ghanbarian *et al.,* (2013) in dental offices in Shiraz (50.5%). Regarding infectious waste generation, clinics 2-4 showed consistent results with the results obtained by Sotoudeh *et al.,* (2011) in Ardebil (47%) and Ghanbarian and Khosravi (2011) in Shahroud (46%). The reason of such a consistency depends on the clinics' capacities and their parts. However, it can be said that about 50% of clinics and dental offices' waste is made up of infectious part which is relatively the same in all parts of Iran. The infectious waste per capita mean for each person is (187.09±9.81 gr) in a day which is the most amount of waste among the three waste groups under the study.

Toxic waste per capita mean for each person was 48.38 ±1.4 gr in a day. This part has the least waste amount among the three waste groups under the study. Kizlary *et al.,* (2005) approximated 6.1gr toxic waste per person in a day; besides, Koolivand stated that the amount of toxic waste generated in dental offices in Hamedan is 0.02 grams in a day (Wong and Kashyap, 1999) which is not in line with the results of this study. The main reason of such a matter is the variety of specialized dental treatments offered by the clinics under the study.

The per capita mean of the chemical and medical part was 147 ±4.33 grams in a day. This amount was 36% in clinic 1 and 39% of the generated waste in other clinics. Such values were not in line with the values obtained by Koolivand *et al.,* (2009) in Hamedan (6.7%), Ghanbarian (2011) in Shahroud (14.9%), and also Ghanbarian (2013) in Shiraz (9.55%); the reason is due to the variety of specialized dental treatments offered by the clinics under the study.

As a result, the highest generated waste per capita belongs to infectious wastes and the lowest one belongs to toxic wastes which are in line with the results obtained by Koolivand (2009), Qanbarian (Ghanbarian *et al.,* 2013; Sotoudeh *et al.,* 2011), and Kizlary (2005) in Greek.

The most amounts of generated infectious materials by each unit in a day are produced in visits, extractions, and scaling services with 31%; then, orthodontics and prosthesis with 28% are placed. The toxic part's per capita mean of the unit was 36% for endodontic therapy day which had the highest mean among other offered treatments; after that, extraction and scaling with 25% are placed. About 98.3% of the chemical and medical part is generated in the orthodontics and prosthesis day.

Hazardous waste management trend in 4 dental clinics in Tehran is as below: clinic 1 had a good management level (in line with the waste management law) and clinic 3 had an average management level (in line with the waste management law). In this study, wastes are segmented in the clinics and some containers have been selected to separate infectious, chemical, medical, toxic, and those with sharp objects (safety box). Infectious wastes are separated from domestic and regular wastes and stored in

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special blue containers; infectious wastes are stored in containers with yellow plastics; and toxic and medical materials are also stored in special containers. On one hand, one of the most necessary requirements to reduce environmental and health problems and also hospital waste management costs is to correctly implement waste separation plans and monitor their correct and healthy disposal which are done in these 4 clinics. The results of a study conducted by Jalilzadeh *et al.,* (2009) on investigating the management of collection, transportation, and disposal of medical wastes in West Azerbaijan Province showed that infectious wastes had been separated from the domestic wastes during this research; besides, in the study done by Falahzadeh *et al.,* (2010), it was realized that 95% respected the separation instruction. In a research done by Darwish *et al.,* (2006) in two cities of Palestine, dental waste management practices of 31 private offices and 6 governmental clinics were investigated; the results proved that 40.5% of the used needles were placed in plastic bottles before being discarded into regular wastes. Besides, bloody bandages and amalgam wastes were discarded into regular wastes. The results of a research conducted by Barafrashtehpour *et al.,* (2010) in Yasouj showed that waste segmentation and separation were done in 83% of the offices. A research performed by Majlesi (2006) demonstrated that 92.3% of hospitals did not segment infectious wastes from regular wastes and they were transported to outside of the hospital altogether. In the study conducted by Garo in Korea, even in case of infectious and noninfectious wastes' segmentation at the generation source, all the generated wastes were transported altogether (Yong-Chul *et al.,* 2006). Waste collection from inside the sections and their transportation to a temporary place was done in a healthy manner in clinic 3; however, they were done manually and in an unhealthy manner with trolleys in other clinics. Based on the report by Mohseni *et al.,* (2001) in Mazandaran on the practice of waste transportation from sections to a temporary place, it was realized that such a thing was manually done in 45% of the hospitals and with trolleys in 55% of them. The studies of Dehghani *et al.,* (2008) proved that 17% of waste transportation is done manually and 58% is done using a trolley.

In this study, all the personnel dealing with waste had health records which are in line with the study conducted by Jalilzadeh *et al.,* (2009). Furthermore, 100% of the personnel dealing with waste collection had proper personal protective equipment which is slightly more than the level mentioned by Falahzadeh *et al.,* (2012) in Yazd Province (93%); this shows the complete command of the management trend over the procedure.

Educating health issues and changing cultures and attitudes as an important issue for groups involved in hospital activities must be done in different stages and considering their needs. People who received educations in these clinics include: managers, nurses, assistants, and service workers whose education methods involved face to face lecturing. The results of the study performed by Tsakona (2007) proved that in the hospitals under the study, 80% of workers dealing with waste collection had been properly educated which is in line with the results of this study.

In this study, clinics 1, 2, and 3 did not immunize their infectious wastes; clinic 4 used to transport their wastes to a hospital in order to be immunized, due to being close to that hospital; this was done by the non-flame immunization method. The reason of such a matter is the non-existence of such an instrument and enough space to keep it.

The results of the study conducted by Falahzadeh *et al.,* (2012) in Yazd Province show that 31% used the non-flame immunization methods at the generation source. In the study conducted by Badaqi *et al.,* (2011) on investigating the practice of medical waste management in hospitals in Mazandaran Province, 32 hospitals were considered and the following results were obtained: 31% used the non-flame immunization method at the generation source, while 34% had the proper place with enough space to perform immunization. Therefore, the results of the present research confirmed the fact that the clinics under the study were not at a desirable level in terms of immunization. Considering article 7 of waste management law and the regulations and practices of medical waste and dependent waste executive management, hospitals must immunize infectious wastes at the generation source.

Amalgam is one of the most conventional materials in teeth restorations which are widely used in dentistry (Cannata *et al.,* 1997). One of the main problems is related with management weaknesses in all

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clinics and units of such clinics and non-recycling of mercury and amalgam; this is in line with the results obtained from studies in different cities of Iran such as the study done by Barafrashtehpour *et al.,* (2010) on offices in Sari (Zazoli *et al.,* 2013), Koolivand *et al.,* (2009) in Hamedan, and also the study conducted in Palestine by Darwish *et al.,* (2006). However, in studies done in countries such as Sweden by Ogden *et al.,* (1990), in Montana in the United States by James (2003), and in India by Sudhakar (2008) and Sushma (2010), amalgam is recycled.

In the present study, the disposal and recycling of the radiographic developer and fixer solutions were done in clinics 1 and 4; however, they were rinsed down the drain in clinics 2 and 3. In the study performed by Viera *et al.,* in Brazil, radiographic fixer and developer solutions used to be rinsed down the drain in 3 cases out of 10. The study done by Barafrashtehpour (2010) in Sari showed that only 5.6% of the offices recycled their materials. Besides, in another research by Barafrashtehpour *et al.,* (2010) in Yasuj, it was found out that the storing method of the fixer solution was to be rinsed down the drain in 90% of the offices.

Conclusion

The most important activity in optimal dental waste management is to prevent the combination of all components of dental wastes with each other. Considering the quality and quantity of the generated dental wastes especially infectious wastes and their unfavorable effects on the peoples' health and environment, it is necessary to compile a distinct policy for the management of dental solid wastes. Also, holding training workshops, knowledge of the staffs in the dentistry care centers should be increased to avoid possible dangers. The elements and components of dental wastes have different characteristics such that their management practice must be based on these characteristics; the combination of dental waste collection and disposal together is not a good idea. Such wastes must be separately collected at first and become sterilized or autoclaved before being disposed of; as a result, it can be concluded that regarding the similarity of type and amount of the generated waste in Tehran's dental centers and other places of Iran and the World, those countries' management patterns in optimal dental waste management must be used. It must be noted, however, that the combination and amount of dental wastes of one office and clinic are different at different times. Regarding what has been said, dental waste management can be well implemented employing a purposeful plan and also correctly modeling other successful management methods in the world and Iran.

Generally, it concluded that there is no proper management of wastes in dental centers of Tehran. It is recommended that the increasing the knowledge of dentists about reduction, separation, and recycling of wastes is essential to achieve the proper management of dental wastes. In the next step, clear codification must be done to restrict the using of certain toxic compound and their discharge to sewer and trash, and, also, continuous monitoring implementation of such codifications. Safe and effective management of waste is not only a legal necessity but also a social responsibility. Lack of concern, motivation, awareness and cost factor are some of the problems faced in the proper hospital waste management. Proper surveys of waste management procedures in dental practices are needed. Clearly there is a need for education as to the hazards associated with improper waste disposal. Lack of apathy to the concept of waste management is a major stymie to the practice of waste disposal. An effective communication strategy is imperative keeping in view the low awareness level among different category of staff in the health care establishments regarding biomedical waste management.

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REFERENCES

Arenholt-Bindsler D (1998). Environmental aspect of Dental Filling Material. *European Journal of Oral Science* **106** 713-720.

Barafrashtehpour M, Rezayi S, Alinejad A and Sadat A (2010). Evaluation of Dental Waste Management in Yasouj. *Thirteenth Congress of Iran Environmental Health* 131-139 [In Persian].

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Bioudaghi H, Panahi Roudsari R, Abadi MH and Mojdeh R (2012). A Survey of the Medical Waste Management Situation Hospital in Mazandaran Province in 2011. *15th National Conference on Environmental Health, 2012 Oct-Nov. 30-1; Gillan, Iran* 66-67 [In Persian].

Birpinar MEBM and Erdogen T (2009). Medical Waste Management in Turkey: A case study of Istanbul. *Waste Management* **29** 445-448, Available: http://14.139.159.4:8080/jspui/bitstream/123456789/9083/1/Gururaju%20final%20-%20CHN.pdf (Accessed on Nov 21, 2011).

Cannata S, Bek M, Baker P and Fett M (1997). Infection Control and Contaminated Waste Disposal Practices in Southern Sydney Area Health Service Dental Clinics. *Australian Dental Journal* **42**(3) 199-202.

Centers for Disease Control and Prevention (2001). Health Infection Control Practices Advisory Committee (HICPAC). Draft Guide Line for Environmental Infection Control in Healthcare Facilities 96-101, Available: www.cdc.gov/hicpac/pdf/guidelines/eic-in-hcf-03.pdf (Accessed on Jul 20, 2012).

Daewish RO and Al-Khatibi A (2006). Evaluation of Dental Waste Management in two Cities in Palestine. *Eastern Mediterranean Health Journal* **12**(2) S217.

Dasilva C, Hoppe A and Ravanello M *et al.*, (2005). Medical Waste Management in the South of Brazil. *Waste Management* **25**(7) 600-605.

Dehghani MH, Azam K, Changani F and Dehghani Fard E (2008). Assessment of Medical Waste Management in Educational Hospital of Tehran University Medical Sciences. *Iranian Journal of Environmental Health Science & Engineering* **5** 131-36.

Falahzadeh A, Dashti MM, Farahzadi MH and Ghadirian D (2010). The Survey of Management of Hazardous Wastes in Hospital of Yazd. *14th National Conference on Environment Health; 2010 Nov; Yazd, Iran* 175-192 [In Persian].

Falahzadeh RA, Mokhtari M, Dashti MM and Jafari V (2012). A Survey on Inefficiency Reasons of Treatment Methods of Infectious Waste in Yazd Hospital in 2012. *15th National Conference on Environmental Health, 2012 Oct-Nov. 30-1; Gillan, Iran* 74-75 [In Persian].

Fan PL and Mc Gill SL (1989). Haw much Waste do Dentists generate? *Journal of California Dental Association* **17**(12) 39-40.

Ghanbarian M and Khosravi A (2011). Investigation Quality and Quantity Dental Waste in Shahroud in 1390 43-46 [In Persian].

Ghanbarian M, Majlesi M and Samaei MR (2013). Study of Dental Wastes Generated in the Dental Office in Shiraz. *Journal of Research in Dental Sciences* **10**(4) 246-52 [In Persian].

Jalilzadeh A, Ashrafi SD and Mahmoudian MH (2009). Evaluation of Collection, Transport and Disposal of Medical Solid Waste in West Azarbaijan Province. *12th National Conference on Environmental Health Iran, Shahid Beheshti Medical Science University; 2009 Nov; Tehran, Iran* 174 [In Persian].

James L, Drummonda B and Michael D (2003). Cailasb, Mercury Generation Potential from Dental Waste Amalgam Kevin Crokeb. *Journal of Dentistry* **31** 493-501.

Kizlary E, Losifidis N, Voudrias E and Takopouios D (2005). Composition and Production Rate of Dental Solid Waste in Xanthi, Greece. *Waste Management* **25** 582-591.

Koolivand A (2007). *Investigation on Dental Solid Waste in Hamedan*. Tehran: Tehran University of Medical Sciences 95-118 [In Persian].

Koolivand A, Nabizadeh R, Jonetdi JA, Younesian M and Omrani Gh. (2009). Quantity and Quality Analysis and Management of Solid Waste Produced in Dentistry Laboratories and Practical Dentist Offices in Hamedan. *Health & Environment* **2**(1) 36-45 [In Persian].

La Grega M, Buckingham P and Evans J (2001). *Hazardous Waste Management,* 2nd edition (New York: McGraw Hill Press) 158-161.

Majlesi M (2006). The Survey of Hospital Waste Management Status of Shahid Beheshti University of Medical Sciences in 2004. *Journal of Pajouhandeh* **58** 308 [In Persian].

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Mohseni A, Javadian M and Yunessian M (2001). Survey of Hospital Waste Collection- Transportation and Disposal in Mazandaran. *Journal of Mazandaran University of Medical Sciences* **11**(32) 45-52 [In Persian].
Ogden G, Bahrami M, Sivarajasingam V and Phillips G (1990). Dental Students' Knowledge and Compliance in Cross Infection Control Procedures at a UK Dental Hospital. *Oral Diseases* **3**(1) 25-30.
Omrani G and Alavi N (2008). *Hospital Solid Waste* (Tehran University Pub.) 12-22 [In Persian].
Sotoudeh M, Religious S, Merrikhi H, Talebi M and Ebrahimi S (2011). Qualitative and Quantitative Analysis and Dental Waste Management in Ardabil City. *The Third Student Congress of Ardabil University of Medical Sciences* **41** [In Persian].
Sudhakar V and Chandrashekar J (2008). Dental Health Care Waste Disposal among Private Dental Practices in Bangalore City, India. *International Dental Journal* **58**(1) 51-54.
Sushma M, Bhat S, Shetty S and Babu S (2010). Biomedical Dental Waste Management and Awareness of Waste Management Policy among Private Dental Practitioners in Mangalore City, India. *Tanzania Dental Journal* **16**(2) 39-43.
Tchobanglous G and Theisen H (1996). *Integrated Solid Waste Management, Engineering Principles and Management Issues* (McGraw Hill Pub.) 39-67.
Trip L (2001). A Pollution Prevention Program for Dental Amalgam Waste. *Journal of Canadian Dental Association* **67** 270-273.
Tsakona M, Anagnostopoulous E and Gidarakos E (2007). Hospital Waste Management and Toxicity Evaluation: A Case Study. *Journal of Waste Management* (27) 912-920.
Wong KV and Kashyap R (1999). Medical Waste Characterization. *Journal of Environ Health* **57**(10) 19-27.
Yong-Chul J, Cargro L and Oh-Sub Y *et al.,* (2006). Medical Waste Management in Korea. *Journal of Environmental Management* **80**(2) 107-115.
Zazoli MA, Barafrashteh Pour M, Mahdavi Y and Rostamali E (2013). Qualitative and Quantitative Analysis and Dental Waste Management in the City of Sari, Iran. *Seventh Congress of Iran Epidemiology; Yasouj University of Medical Sciences* 133 [In Persian].

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