

# Evaluation of Infection Control in Dental Offices in Hamadan in 2010

Shojaei, S.\* Jamshidi, S.\* Moghimbeigi, A. \*\* Mostaghimi, N. \*\*\*

\*Assistant Professor, Dental Research Center, Department of Oral and Maxillofacial Pathology, Faculty of Dentistry, Hamadan University of Medical Sciences, Hamadan, Iran

\*\*Assistant Professor, Department of Biostatistics, Hamadan University of Medical Sciences, Hamadan, Iran.

\*\*\*Dentist

## ABSTRACT

**Statement of the Problem:** The incidence of infectious diseases is considerably high among dentists and the team of dental care providers because of frequent exposure to blood and saliva. Therefore, infection control regulations must be taken seriously in order to prevent cross-contamination.

**Purpose:** The aim of the present study was to investigate infection control measures in dental offices in Hamadan, Iran in 2010.

**Materials and methods:** In this descriptive cross-sectional study, 77 general and 54 specialized dental offices provided information in terms of the level of infection control measures. The information was obtained via observation and questionnaire. The questionnaire was compiled in eight sections, including the environmental safety and building characteristics, the dental unit, the accessories, instruments, materials, environmental protection, personal protection and infection control behaviors and disposing the wastes. Data were analyzed using chi-squared, Mann-Whitney U and Kolmogorov-Smirnov tests and comparisons were made between the general and specialized dental offices.

**Results:** Infection control statuses in the general and specialized dental offices in relation to the dental unit were 23.09% and 76.22%; in relation to instruments they were 67.34% and 95.57%; and in relation to personal protection they were 58.50% and 64.42%, respectively. Infection control measures revealed significant differences between the general and specialized offices in relation to all the aspects except the personal protection measures ( $P < 0.05$ ).

**Conclusion:** This study demonstrated that specialized offices were more successful in implementing infection control measures; however, there is room for improvement and further education and supervision is required to reach the optimum level of standards.

**Keywords:** Infection control, specialized offices, general offices.

## INTRODUCTION

One of the major health issues concerning the governments over the recent decades is a rapid increase in the rate of fatal contagious diseases. The significance of this issue has prompted the officials to allocate a considerable amount of their

**Corresponding author:** Dr. S. Jamshidi, Address: Dental Research Center, Faculty of Dentistry, Shahid Fahmide Street, Hamadan, P.O. Box: 65176-59114, Iran, Tel: 988118354140, E-mail: dr.jamshidi39@yahoo.com

national budget to the control and eradication of these conditions. Because of the increased risk of exposure to infectious diseases among health care workers, governments have set specific guidelines to reduce the chances of cross-contamination. Dentistry is among the professions involved in increased risk of exposure to infectious diseases and therefore requires strict infection control measures.<sup>(1, 2)</sup>

Injury with contaminated sharp objects and burs, needle stick injuries, inadequate protection of fresh wounds against contaminated blood or saliva due to failure to wear gloves or spray of contaminated liquids on the skin or mucosa are among the most important occupational hazards concerning the dental team.<sup>(3, 4)</sup> Most of the exposures are accidental and can easily be prevented by infection control guidelines. The inevitable cases, however, are controlled via timely vaccination and appropriate management of accidents to prevent the potential consequences.<sup>(5,6)</sup> Currently, the prevalence of deadly infectious diseases such as AIDS and hepatitis B have raised great concern among authorities regarding infection control measures and prevention of cross-contamination among health care workers and patients.<sup>(3,7)</sup>

To minimize microbial transmission in a health care setting, infection control measures are applied. An effective infection control plan requires that all the patients be treated as if they were carrying a fatal infectious disease.<sup>(8)</sup>

Various means of infection control include personal protection such as gloves, masks and eye protection, immunization against infectious diseases (i.e. hepatitis B vaccination) and finally sterilization and disinfection.<sup>(9)</sup>

Studies are indicative of insufficient knowledge among the dental care providers throughout the country. Given the

importance of maintaining the health of the dental personnel and the patients and lack of documented evidence on the status of infection control measures implemented in dental offices in Hamadan, this study was carried out to evaluate the level of infection control among dental care centers and provide information on the current status with the hope of reaching the optimum standards of infection control in dental care centers.

### **MATERIALS AND METHODS**

A descriptive cross-sectional study, including all general and specialized dental offices in Hamadan, Iran, was conducted in 2010. According to the data obtained from the Hamadan Medical Council, the number of general and specialized dental offices at the beginning of the survey were 109 and 40, respectively, which increased by the end of the study. The questionnaire that was used in this study was taken from Public Health EBook (10) and subsequently distributed among the dental offices in Hamadan.

The questionnaire consisted of 73 questions compiled in 8 sections, including the environmental safety and building characteristics, the dental unit, the accessories, instruments, materials, environmental protection, personal protection and behaviors associated with waste disposal. The survey also included the following demographic information: type of the dental office (general or

specialized), age, sex and years of experience of the dentist.

The investigators attended each dental office in person and after thorough explanation of the aims of the study and the contents of the questionnaire, asked the dentist to complete the questionnaire anonymously. Dentists chose to participate on a voluntary basis and data were kept confidential. In order to minimize bias, parts of the data pertaining to the constructional characteristics of the dental offices building were recorded based on observational findings. Positive and negative responses were scored 1 and 0, respectively.<sup>(1)</sup>

To facilitate comparison with other studies, the nominal scores were converted to percentages and reported descriptively (in the form of tables, diagrams and statistical indices). Furthermore, data were submitted to the Statistical Package for the Social Sciences software (Version 15) and analyzed using chi-squared and Mann-Whitney U tests. Comparison between the variances was performed using the Kolmogorov-Smirnov test. The results were reported in each section individually and also collectively.

## RESULTS

A total of 77 general and 54 specialized offices volunteered to contribute to this survey. Of the 77 general dentists, 30 were male and 6 were female with less than 11 years of experience and 31 male and 10 female with more than 11 years of

experience. In the specialists' group, 15 males and 10 females with less than 11 years of experience and 21 males and 8 females with more than 11 years of experience completed the survey.

Table 1 demonstrates the infection control status among the dental offices in Hamadan. The highest level of infection control pertained to instruments (in specialized dental offices) whereas the lowest level was associated with disposal of hazardous wastes (in general dental offices).

According to Table 2 and the Kolmogorov-Smirnov test results and histograms, the normality among the variables suggested the use of nonparametric tests for data analysis within each group (general and specialized offices). The Mann-Whitney test comparing different aspects of infection control measures among the general and specialized offices revealed significant differences between all the aspects except the personal protection measures ( $P < 0.05$ ).

In terms of the age of the dentists, the study population was categorized into three age groups; 25–30, 30–45 and over 46 years of age. There were no significant differences in the overall status of infection control with respect to age. However, considering each section of the questionnaire individually, the only marked difference was noted in the questions pertaining to “personal protection” ( $P < 0.05$ ).

Years of experience was categorized into two major categories, i.e. less and more

than 11 years. Statistical analysis failed to reveal any significant differences in infection control measures among the

dentists in terms of years of experience or gender ( $P>0.05$ ).

**Table 1: Infection control status in dental offices in Hamadan in 2010 (percentage)**

Infection control aspect	General offices (n=77)	Specialized offices (n=54)
Environmental safety and building characteristics	53.56	70.77
Dental unit	23.09	76.22
Accessories	38.25	51.50
Instruments	67.34	95.57
Materials	69.92	87.33
Environmental protection	49.60	44.40
Personal protection	58.50	64.42
Infection control behaviors	38.54	45.67
Wastes disposal	21.50	64.75

**Table 2: Comparison between infection control status among general and specialized dental offices (P-value)**

Infection control aspect	P-value
Environmental safety and building characteristics	<0.001
Dental unit	<0.001
Accessories	<0.001
Instruments	<0.001
Materials	<0.001
Environmental protection	0.009
Personal protection	0.414
Infection control behaviors	<0.001
Wastes disposal	<0.001

## DISCUSSION

Infection control methods aim to minimize microbial transmission and cross-contamination between individuals or from contaminated surfaces to human beings.<sup>(1)</sup> It is considered a critical component of dental care, especially in societies where the rate of exposure to cross-infections such as HIV and HBV tends to increase with time. Iran is amongst the countries where the incidence rate of such diseases is rapidly growing and thus this study aimed to assess the status of infection control measures in dental care centers in Hamadan, Iran in 2010.

In terms of the structural standards pertaining to the office building, the specialized offices in the present study were in a more favorable status. The component gaining the lowest score in this section was associated with the storage room conditions. Only 11.7% of the general offices had a storage room, of which only a limited percentage had appropriate ventilation system. Even in the specialized offices with more storage rooms (more than 50%); only a small number met the standards of environmental safety and infection control. In the present study, 81.8% of the general dentists attempted to disinfect the light handle of the unit between each patient whereas in Barmaki's report, this percentage was as low as 25%,

which indicates a significant improvement in this aspect of infection control with time.<sup>(11)</sup>

The results of the present study indicated that steam heat sterilization (autoclave) was unanimously used in all the general and specialized offices and dry heat sterilization (oven) was used in 41.1% and 31.2% of the specialized and general dental offices, respectively. According to Eghbali's report, all the general dentists and specialists in Dehloran, Darrehshahr, and Abadan applied both steam heat and dry heat sterilization.<sup>(12)</sup> Kheirandish et al reported that all the general offices utilized dry heat sterilization procedures and only 47.1% of them had an autoclave for sterilization in Hamadan.<sup>(13)</sup> In another report, 16.4% of dental clinics and offices throughout the city used steam heat and 82.2% used dry heat sterilization in Isfahan.<sup>(1)</sup> Therefore, the results demonstrated a higher rate of the use of steam heat sterilization among dental offices in Hamadan. Considering the extensive use of instruments such as high-speed and low-speed air motors and other metal instruments in dentistry and the fact that the most appropriate mean of sterilizing these instruments is steam heat under pressure, it can be concluded that the level of sterilization among the offices in the present study was optimal.

In assessing the consistency between sufficient availability of instruments and the number of patients, the specialized offices

were in a more favorable state with 98.96% availability compared with 87.3% in general offices. All the surgical, operative, endodontic and orthodontic instruments, burs, dental mirrors, and forceps utilized in the offices in the present survey were thoroughly sterilized. Molaee et al reported that the overall rate of sterilization of the instruments in private (general and specialized) and governmental dental offices were 36.4% in Meshkinshahr.<sup>(14)</sup>

Based on our findings, all the dental offices, except for one general dentist's office, used disinfectants to clean instruments. In Molaee's study, however, specialized offices performed better in this aspect compared with governmental offices and general dentists' office in Meshkinshahr.<sup>(14)</sup>

In terms of the environmental safety and infection control of surfaces, the present study confirmed that 63% and 76.6% of the specialized and general offices, respectively, carried out cleaning of the floors (and other surfaces) on a daily basis. According to Molaee's study only 45.5% of the general and specialized offices of Meshkinshahr had their floors cleaned on a daily basis, which was lower compared with this study.<sup>(14)</sup> In another study, surface cleaning was performed on a daily basis in all the offices, which indicates the necessity of further attention to this aspect in dental offices of the region.<sup>(15)</sup>

The specialized offices in the present survey demonstrated higher level of safety measures in the use of masks and gloves.

Other studies have reported various rates of the use of personal protective measures. In Molaee's study<sup>(14)</sup> for instance, all the general and specialized dental offices and governmental clinics in Meshkinshahr reported regular use of masks and gloves, which clearly marked a higher level of infection control in this aspect compared with the present report. Similarly, based on Yengopal's report,<sup>(16)</sup> the frequency of the use of masks and gloves in dental offices in Durban was 82.4% and 97%, respectively, which was higher than the rate presented in this survey. Ghalamkarpour et al conducted a similar study in Tehran in which the rate of the use of gloves and masks among general dentists was reported 75.4% and 61%, respectively.<sup>(17)</sup> Compared with the present report, the latter study had a higher level of the use of gloves and a lower level of the use of masks. In another study in Turkey, the study population consisting of 80% general dentists reported a 95% rate of the use of masks and gloves in their practice, which again was significantly higher compared with the present study.<sup>(18)</sup> Because of the importance of the implementation of personal safety measures, inadequate attention to this aspect of infection control may expose the dental care providers and the patients to hazardous health conditions.<sup>(8)</sup>

Vaccination is one of the most important means of preventing cross-contamination. According to the present survey, only one specialist failed to perform adequate

vaccination against hepatitis B and in terms dentist and one specialist maintained valid titration documents. Ghalamkarpour demonstrated that 97.5% of the general dentists in Tehran were vaccinated against hepatitis B<sup>(17)</sup> and Haeri-Tabatabaei reported a vaccination rate of 95.4% among general dentists, both of which were lower than the rate presented in the present study.<sup>(19)</sup> Furthermore, the rate of vaccination according to Gore, McCathy and Leggat in Scotland, Canada and Thailand were 88%, 97.3% and 68%, respectively.<sup>(20-22)</sup>

International studies have documented that dental care providers have the highest rate of vaccination against hepatitis B among health care workers (over 98%).<sup>(4)</sup> In the present study, the rate of vaccination and antibody titration against HBV was close to 100%, which not only indicates the high level of education and realization of the importance of immunization among the society, but also depicts the impact of the efforts of the Ministry of Health Services in providing free vaccination for all.

In general, the rate of personal protection in dental clinics seems to be higher among the dentists compared with the assistants and the staff, which might be attributed to higher level of knowledge and concern among them. The rates of vaccination among dental assistants in specialized and general offices in the present survey were 100% and 93.5%, respectively, and the rates of antibody titration for both groups

of the antibody titration, all but one general were 94.4% and 63.6%, respectively. According to Ghalamkarpour's study, the rate of vaccination among the staff of the dental offices in Tehran was even lower (56.4%).<sup>(17)</sup> These data are obtained while based on the infection control regulations set by the Ministry of Health Services, dental assistants are required to maintain sufficient documentation regarding complete vaccination and antibody titration at all times.<sup>(3)</sup> Thus, dentists should be further concerned about their staff's personal safety in terms of using masks, gloves, and proper vaccination.

In the present study, the scoop technique for needle recapping was more frequently used in specialized offices compared with general offices. In another survey in Hamadan, 57.4% of the dentists working in governmental clinics were exposed to needle stick injuries more than once in a year. This indicates lack of attention to self-protection; therefore, it advisable for dentists to take further precautions and imply safer techniques for needle recapping to avoid needle stick injuries.<sup>(23)</sup>

Our findings in terms of disposing hazardous wastes revealed that specialized offices were more attentive than the general offices (specialized offices: 98.1%, general offices: 63.6%). According to Molaei's study, sharp objects in specialized and general dental offices and governmental clinics throughout Meshkinshahr were disposed of in metal containers.<sup>(14)</sup> Based on

the report provided by Eghbali et al, dental in Dehloran, Dareh-shahr and Abdanan,<sup>(12)</sup> the rate of which compared with the present results among the general and specialized offices were higher and lower, respectively. The rate of the use of safety boxes among the general and specialized dental offices in Ilam was reported to be 60.78%, which was lower than the rates presented in this report.<sup>(24)</sup> Considering the significance of dental wastes and categorizing them among the hazardous medical wastes, extra precautions should be taken in terms of handling and disposing them.<sup>(8)</sup>

Statistical analysis failed to reveal any significant differences in terms of the overall infection control level among different age groups. However, considering different sections of the questionnaire, the test results did reveal one significant difference in the section related to “personal protection”.

In terms of gender, male and the female dental specialists demonstrated higher level of infection control in specialized dental offices in Hamadan. Infection control measures pertaining to “accessories” and “personal protection” were higher in the male group and those pertaining to “waste disposal” were higher in females. Based on statistical analysis, there were no significant differences in the level of infection control between dentists with over 11 years of experience and those with less than 11 years of experience. Generally, statistical tests failed to reveal any significant

offices used safety boxes for waste disposal association between sex, age, and years of experience and the status of infection control among dental offices in Hamadan. According to a similar study by Ozturk et al, infection control did not differ significantly with respect to gender, which was consistent with the present findings.<sup>(18)</sup> Contrary to the results presented in the present study, Haeri-Tabatabaee and co-workers reported that dentists with over 10 years of experience performed more favorably in terms of infection control measures.<sup>(19)</sup> Another report from Sari, Mazandaran, indicated that dentists with less than 5 years of experience were more attentive in following infection control guidelines.<sup>(24)</sup> According to Razavi’s study, young dentists received the lowest score (11.9 out of 20) and experienced dentists received the highest score (14.34 out of 20) in terms of infection control measures. Furthermore, female and male dentists received 16.1 and 10.87 scores on their infection control performance, respectively, which is inconsistent with the results of the present report.<sup>(1)</sup>

## **CONCLUSION**

According to the results presented in this study, the overall status of infection control in dental offices is deemed inadequate and attempts should be made to raise the level to 100%. The specialized offices appeared to have a slightly higher level of infection control, yet there is room for further improvement in both the general and the



specialized offices. Considering the importance of infection control measures and education and implementation of these measures, it is recommended that extensive courses of infection control be provided for the dental care team enhanced by further strict supervision of the implementation of the guidelines.

## REFERENCES

1. Razavi M, Motaghi A, Sajadi M, Jahanbakhsh M. An Evaluation of Infection Control in Dental Offices and Dental Offices in Isfahan. *Journal of Isfahan Dental School* 2003; 2(4):16–22.
2. Roberson TM, Heymann HO, Edward J, Swift JR. *Art and science of operative dentistry*. 5th Ed. USA: Mosby Co; 2006. P.391–393.
3. Kakooi S, Sheibani GH, Mohammad Alizade S. Knowledge and practice of dentists' offices in Kerman about Hepatitis B. *Dental Journal of Shahid Beheshti University of Medical Sciences* 2005;25(1):593–599. (Persian )
4. Miller CH, Dalenic CJ. *Infection control and management of hazardous materials for the dental team*. 2nd Ed. St Louis: Mosby Co; 1998. P.54–59.
5. Zaker Jafari H, Mohammadi H. Awareness, attitudes and behavior of dental students in rosthesis Department of Rasht Dental school in infection control. *J Infective Diseases* 2008;13(41):71–4. (Persian )
6. Hashemipour M, Moshrefian SH, Mohammad Alizade S, Ravai H. Evaluation of infection control in dental labs in Kerman. *Journal of Isfahan Dental School* 2007; 4(1):17–23.
7. Taheriabkooh R, Ghasemi H. *Occupational hazards in the dental profession*. 1st Ed. Mashhad: Jahad Daneshgahi Co; 1999. P.126–133. (Persian )

## ACKNOWLEDGEMENTS

This manuscript is based on a thesis submitted for the degree of Doctor of Dental Surgery (thesis number: 581) in the School of Dentistry, Hamadan University of Medical Sciences, Hamadan, Iran in 2010. The authors wish to thank all the dentists who participated in this study.

8. Alipour V, Araghizade A, Dinarloo K, Rezai L. Status of infection control in dental offices in Bandarabbas (2007). *Hormozgan Medical Journal* 2009; 12(2):115–120.
9. Wehida S, Farred ME, Shehata AE, Elhendawy GR. Infection control practices in Dental offices. *Bull. Alex. Fac. Med* 2008;44(4):841-853.
  - a. Razavi SM, Afzaee K. Self assessment technique .2010[14 screens] Available at: [http://www.elib.hbi.ir/persian/PUBLIC HEALTH\\_EBOOK/06\\_02.pdf](http://www.elib.hbi.ir/persian/PUBLIC_HEALTH_EBOOK/06_02.pdf) .
10. Barmaki B. The evaluation of action and attitude of dentists practicing in Hamadan city regarding disinfection of unsterilizable surface and exchange of disposable equipment in relation for cross infection control in 1998. (Dissertation). Hamadan (MO): Dental School, Hamadan University of Medical Sciences, 1998. (Persian)
11. Eghbali A. Evaluation of infection control in dental offices in Dareshahr, Abadan, Dehloran (2007). (Dissertation). Tehran (MO): Dental School, Shahid Beheshti University of Medical Sciences, 2007. (Persian)
12. Kheirandish M. The evaluation of materials, equipment and infection control in Hamadan dental offices in 2004. (Dissertation). Hamadan (MO): Dental School, Hamadan University of Medical Sciences, 2004. (Persian)

13. Molaei B. Evaluation of infection control in private dental offices and state dental office in Meshkinshahr (2008). (Dissertation). Tehran (MO): Dental School, Shahid Beheshti University of Medical Sciences, 2008. ( Persian)
14. Onana J, Ngongang A. Hygiene and methods of decontamination, disinfection and sterilization in dental offices in Yaounde. *Odontostomatol Trop* 2002; 25(97):45–51.
15. Yengopal V, Naidoo Sm, Chikte UM. Infection control among dentists in private practice in Durban. *Scand Assoc Dent J* 2001; 56(12):580–4.
16. Ghalamkarpoor Z, Arab ameri J. Methods of preventing transmission of infection in the office among students term 7-12 of Dental School of Shahid Beheshti University (2007). (Dissertation). Tehran (MO): Dental School, Shahid Beheshti University of Medical Sciences, 2007. ( Persian)
17. Ozturk M, Ozec I, Kilic E. Utilization of personal protective equipment in dental practice. *Int Dent J* 2003; 53(4): 218–219.
18. Haeri-Tabatabaei A, Asgari S. Evaluation of infection control method among dentists attending at 5th and 6th International Congress of Iranian Endodontics Association (Dissertation). Tehran (MO): Dental School, Shahid Beheshti University of Medical Sciences, 2002–2003. ( Persian)
19. Gore SM, Felix DH, Bird AG, Wray D. Occupational risk and precautions related to HIV infection among dentists in the Lothian region of Scotland. *Infect J* 1994; 28(2): 209-22.
20. McCathy GM, MacDonald JK. The infection control practices of general dental practitioners. *Infect Control Hosp Epidemiol J* 1997; 18(10): 699-703.
21. Leggat PA, Chowanadisai S, Kukiattrakoon B, Yapong B, Kedjatune U. Occupational hygiene practices of dentists in southern Thailand. *Int Dent J* 2001; 51(1):11–16.
22. Mohammadimarzooni M. The evaluation of methods of cross infection control in government dental offices in Hamadan (1998). (Dissertation). Hamadan (MO): Dental School, Hamadan University of Medical Sciences, 1998. ( Persian)
23. Darbandi A, Honardar K, Zavieh A, Raisi H. Evaluation of infection control in private dental offices Ilam (2002). (Dissertation). Tehran (MO): Dental School, Shahed University of Medical Sciences, 2002. (Persian)
24. Haghani Far S, Heidari B: A survey on the knowledge of general dental practitioners about sterilization and disinfection in Sari. *Journal of Babol University of Medical Sciences* 2004; 6(3):52–55.