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Knowledge and Practice of Dental Students and Dentists Regarding Infection Control Protocols in Isfahan, Iran

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Abstract

Background and Aim: Transmission of infectious agents may occur in dental practice. This study aimed to evaluate and compare the knowledge and practice of general dentists, dental specialists, postgraduate students, and undergraduate 5th and 6th year dental students about infection control and prevention of cross-contamination in dental office.

Materials and Methods: A total of 155 dental specialists, general dentists, and postgraduate and undergraduate 5th and 6th year dental students participated in this cross-sectional study. The self-administered questionnaire was composed of 2 parts (knowledge and practice). Data were analyzed by the Kruskal-Wallis, and Mann-Whitney tests, one-way ANOVA, t-test and Bonferroni test (alpha =0.05).

Results: No significant difference was found in knowledge about the hepatitis B virus (HBV) and human immunodeficiency virus (HIV)/AIDS transmission, wearing a mask, and use of protective glasses, shields or gown for each patient, among the participants. A significant difference was found in the practice of study groups regarding the use of protective glasses, shields or gown (P=0.003).

Conclusion: In general, the knowledge of participants about infection control was poor; however, their practice was different and there is a need for further education to enhance the knowledge of dental healthcare providers about infection control.

Key Words: Professional Practice; Infection Control; Knowledge; Dentists

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Introduction

Infection transmission occurs easily in dental practice. Dental healthcare workers and their patients are at high risk of infection since they are exposed to a number of microorganisms, such as hepatitis B (HBV) and C (HCV) and the human immunodeficiency virus (HIV). Microorganisms may be transmitted through blood or saliva during dental procedures [1-3]. Infection transmission in dental practice often occurs through direct contact with droplets and aerosols or indirect contact with contaminated instruments and surfaces [1]. Aerosols are generated when dental drills and ultrasonic scalers are used particularly along with water sprays [1]. Thus, it is imperative to prevent cross-contamination by adherence of healthcare workers to

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infection control measures [4]. All patients should be considered as potential carriers of pathogenic microorganisms [5]. Despite all the efforts, occupational diseases continue to impose significant costs on the healthcare system worldwide, and the risk of cross-infection remains high [6].

Universal precautionary measures for infection control in dental practice have been proposed by the Center for Disease Control and Prevention. Preventive measures adopted to minimize blood and percutaneous exposures are as follows: (I) careful handling of sharp instruments, (II) using a rubber dam to minimize blood spattering, (III) hand washing, and (IV) use of protective equipment (e.g., gloves, masks, protective glasses, and gowns) [7].

In spite of the fact that a few guidelines and recommendations were released by the authorities and governmental organizations, evidence shows poor adherence to infection control measures in dental settings and hospitals [8, 9]. Literature shows variable levels of knowledge and practice of dental healthcare providers regarding infection control in Iran (8), highlighting the need for knowledge enhancement of dental healthcare workers and improvement of their adherence to infection control measures [2].

Thus, the objective of this study was to assess the knowledge level and practice of dental specialists, general dentists, postgraduate students, and 5th and 6th year undergraduate dental students in Isfahan, Iran about infection control and prevention of cross-contamination in dental office.

Materials and Methods

In this cross-sectional study conducted from April 2020 to March 2021, a questionnaire was distributed among 155 participants including postgraduate students who had clinical training experience, undergraduate 5th and 6th year dental students of Islamic Azad University, Isfahan (Khorasgan) Branch, and dental specialists and general dentists working in private or public sectors in Isfahan.

This study was approved by the Ethics Committee of Islamic Azad University, Isfahan (Khorasgan) Branch (IR.IAU.KHUISF.REC.1399.088). Written informed consent was obtained from all participants. The participants were informed that participation in the study was voluntary and they were ensured about the confidentiality of their information.

Questionnaire:

The self-administered questionnaire was composed of 2 parts: questions regarding knowledge and questions regarding practice of the guidelines with respect to the key aspects of infection control, sterilization and disinfection of dental instruments, personal protective equipment, and infectious diseases and their modes of transmission. The first part of the questionnaire assessed the knowledge level of the participants with five questions with 4 answer choices (always, often, sometimes, and never) and six detailed questions. The second part consisted of 11 questions which assessed the practice of individuals regarding prevention that were "yes" or "no" questions or questions with four answer choices (always, often, sometimes, and never) (Table 1). Each correct answer was scored one point, and incorrect answers were not scored. Finally, the percentage of participants with correct answers was calculated. The questionnaire's validity and reliability had been confirmed in a previous study [10].

Statistical analysis:

Data were analyzed by the Kruskal-Wallis and Mann-Whitney tests, one-way ANOVA, repeated measures ANOVA, and Bonferroni test using SPSS version 24 at 0.05 level of significance. The collected data were tabulated and the frequency of answers and the mean and standard deviation values were calculated. Knowledge level of the participants was classified as poor for cases with lower than 50% correct answers, moderate for those with 50-75% correct answers, and good for those with over 75% correct answers (10).

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Table 1. Questionnaire

Knowledge Related Questions	**A) How often do you use personal protective equipment?**		Always		Often		Sometimes		Never		
		Face masks									
		Gloves									
		Protective glasses									
		Shields									
		Gowns									
	B) When is the preferred time for exchange of gloves during treatment?	Every 20 minutes	Every 30 minutes		Every hour		Never				
	C) Can HIV/AIDS be transmitted through saliva?		YES				NO				
	Can HBV be transmitted through saliva?		YES				NO				
	D) How do you disinfect the following dental equipment?		Water	Ethanol	Glutaraldehyde	Ethylene oxide	Iodophor	Microthene	Deconex	Autoclave	Chemiclave	Dental oven
		High-speed and low-speed hand-pieces										
		Burs										
		Instruments										
		Syringe										
		Amalgam carrier										
		Files and broches										
		Shields and glasses										
		Clamps, forceps										
		Light curing unit										
		Metal impression trays										
		Plastic impression trays										
		Radiographic sensors										
	E) How do you disinfect the following dental impression materials?		2% Alkaline Glutaraldehyde	2% Alkaline Glutaraldehyde	Glutaraldehyde-Phenolic compounds	Synthetic Phenol	Sodium Hypochlorite	Iodophor	Chlorine Dioxide		
		Polysulfide									
		Polyether									
		Silicone									
		Zinc oxide eugenol									
		Alginate									
		Hydrocolloids									

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Knowledge Related Questions	**F) What type of disposable wrap do you use?**	1)Dental unit 2)Cabinet surfaces 3)Radiographic panel	Plastic	Papers	Foils	Nothing
	1) Have you received vaccination against HBV?	YES			NO	
Practice Related Questions		Always	Often	Sometimes		Never
	2) Do you take medical history for each patient?					
	3) Do you use special head cover during treatment?					
	4) Do you use accessories during treatment?					
	5) Do you wash your hands before treatment?					
	6) Do you wash your hands immediately after treatment?					
	7) Do you change handpieces after each appointment?					
	8) do you use autoclave for sterilization of handpieces?					
	9) Do you use wrapping bags for instrument sterilization?					
	10) Do you have an appropriate protocol for emergency treatment of needle stick?					
	11) Do you use a special container for sharp instruments?					

*Each question may have one or more answers.

Results

Of 155 participants, 35.5% were males and 64.5% were females. There were 31 (20%) dental specialists, 31 (20%) general dentists, 31 (20%) post-graduate dental students, and 62 (40%) undergraduate dental students. Of all, 132 participants (85.2%) had under 5 years of work experience, 14 (9%) had 5 to 15 years of work experience, and 9 (5.8%) had 15 to 25 years of work experience.

No significant difference was detected in knowledge about the HBV and HIV/AIDS transmission among the participants (P>0.05).

Responses to questions regarding wearing a mask and use of protective glasses, shields, or gowns for each patient showed no significant difference in knowledge among dental specialists, general dentists, post-graduate dental students and undergraduate dental students (P>0.05).

Table 2 compares the knowledge level of study groups about sterilization of equipment, disinfection of surfaces, disinfection of dental impression materials, and how to properly dispose needles and sharp instruments.

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Table 2. Comparison of the mean knowledge score of study groups about HBVand HIV/AIDS transmission, using protective wraps, washing hands and using gloves, disinfection of dental instruments, impression material and surfaces and disposal of needles

	HBV and HIV/AIDS Transmission				Using protective wraps				Washing hands and using gloves				Sterilization of dental instruments				Dental impression material disinfection				Disinfection of surfaces				Disposal of needles and sharp instruments			
Groups	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**
Dental specialists	a1.98	0.49			a1.90	0.51			a2.70	1.22			*a2.15	0.97			*a1.34	0.87			*a5.17	1.60			*a1.73	0.91		
Post-graduate dental students	a1.87	0.52			a1.65	0.42			a2.64	1.37			ab1.77	0.87			a1.25	0.50			a4.84	1.71			a1.45	0.85		
			0.25	0.86			1.90	0.07			0.04	0.98			5.05	0.00			2.26	0.08			2.26	0.08			0.83	0.47
General dentists	a1.96	0.54			a1.70	0.37			a2.68	1.38			a1.92	0.58			a1.31	0.41			a5.05	1.74			a1.64	0.52		
Undergraduate dental students	a1.92	.473			a1.69	0.51			a2.61	1.25			b1.43	0.64			a0.94	0.80			a4.89	1.41			a1.52	0.77		
Total	1.93	.499			1.77	0.47			2.67	1.29			1.84	0.79			1.23	0.71			5.02	1.57			1.57	0.77		

*Similar letters indicate no significant difference between the study groups using the Bonferroni post-hoc test.

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Regarding the knowledge level of study groups about disinfection or sterilization of dental instruments and equipment, the highest mean knowledge score belonged to dental specialists and the lowest to dental students. Based on the Bonferroni test results, a statistically significant difference was observed between dental specialists and dental students and also a significant difference was observed between general dentists and dental students (P=0.002). However, no statistically significant difference was found among the groups regarding disinfection of impression materials, or surfaces (P=0.083) or the knowledge about disposal of needles and sharp instruments (P=0.475).

There was a statistically significant difference between males and females in knowledge about HBV and HIV/AIDS transmission and disinfection of instruments (P<0.05). The total mean knowledge score for HBV and HIV/AIDS transmission in males (2.08±0.45) was higher than in females (1.85±0.50). However, the total mean knowledge score about instrument disinfection was higher in females (1.96±0.79) than males (1.62±0.74). There was no statistically significant difference among the groups in other variables (P>0.05).

The practice data with respect to HBV and HIV/AIDS transmission are presented in Table 3. Although the mean score was higher among dental specialists, the difference was not statistically different (P=0.55).

Regarding the practice of participants with respect to using protective glasses, shields or gowns as shown in Table 3, the highest mean score of practice belonged to dental specialists (mean score of 2.2) while undergraduate dental students were found to have the lowest mean practice score (mean score of 1.5). A significant difference was found in the mean practice score of the participants (P=0.003).

Regarding the practice of the participants with respect to washing hands and using gloves, dental specialists and general dentists had a significantly higher mean score of hand hygiene (1.9±0.7) than post-graduate dental students and undergraduate dental students (1.7±0.6 and 1.5±0.6, respectively); although this difference was not statistically significant (P=0.126, Table 3).

The results showed that the highest mean practice score regarding disinfection and sterilization of dental instruments was observed in dental specialists with a mean score of 2.3±0.8; the difference in this regard was significant among the four study groups (P=0.000). However, regarding disinfection of dental impression materials, both dental specialists and general dentists showed the highest mean score of practice and there was a significant difference between these two groups with undergraduate dental students and post-graduate dental students (P=0.008). However, there was no significant difference in practice of study groups regarding sterilization of dental surfaces (P=0.68, Table 3).

In addition, no significant difference was found regarding disposal of needles and other sharp instruments among the four study groups (P=0.56).

The mean practice score for sterilization of dental instruments was found to be significantly higher in females than males (P=0.042); while in other variables, males and females had almost similar mean scores of practices.

The results showed that in terms of disinfection and sterilization of dental instruments, those with 15-25 years of experience in the field had the highest mean score of practice (P=0.044). However, no significant difference was found in the mean score of practice in other variables among participants with different years of experience.

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Table 3. Comparison of the mean knowledge score of study groups about HBVand HIV/AIDS transmission, using protective wraps, washing hands and using gloves, disinfection of dental instruments, impression material and surfaces and disposal of needles

	HBV and HIV/AIDS Transmission				Using protective wraps				Washing hands and using gloves				Sterilization of dental instruments				Dental Impression material disinfection				Disinfection of surfaces				Disposal of needles and sharp instruments			
Groups	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**	**Mean**	**SD**	**F-test**	**p-value**
Dental specialists	*a1.98	0.49			*a1.90	0.51			*a2.70	1.22			a2.15	0.97			a1.34	0.87			a5.17	1.60			a1.73	0.91		
Post-graduate dental students	a1.87	0.52			a1.65	0.42			a2.64	1.37			ab1.77	0.87			a1.25	0.50			a4.84	1.71			a1.45	0.85		
			0.25	0.86			1.90	0.077			0.04	0.98			5.05	0.00			2.26	0.08			2.26	0.08			0.83	0.47
General dentists	a1.96	0.54			a1.70	0.37			a2.68	1.38			a1.92	0.58			a1.31	0.41			a5.05	1.74			a1.64	0.52		
Undergraduate dental students	a1.92	.473			a1.69	0.51			a2.61	1.25			b1.43	0.64			a0.94	0.80			a4.89	1.41			a1.52	0.77		
Total	1.93	.499			1.77	0.47			2.67	1.29			1.84	0.79			1.23	0.71			5.02	1.57			1.57	0.77		

* Similar letters indicate no significant difference between the study groups using the Bonferroni post-hoc test.

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Discussion

Infection control in dentistry is of critical importance, and therefore, training of dentists regarding the most up-to-date infection control measures is imperative [11, 12]. Evaluating the knowledge level of dentists in theory and practice regarding infection control is the first step in this process [13, 14]. The present study evaluated the knowledge and practice of four groups of Iranian dental healthcare workers, including dental specialists, general dentists, and postgraduate and undergraduate 5th and 6th year dental students. In general, knowledge and practice of infection control were unsatisfactory in all study groups. Knowledge of dental specialists about hand washing and using gloves was significantly higher than other study groups. Also, in practice, dental specialists scored significantly higher than the other groups in several items including the use of protective equipment, disinfection of dental instruments, and disinfection of dental impression materials.

The Iranian dentists' knowledge and practice regarding infection control have been evaluated in several earlier investigations. Rostamzadeh et al. evaluated the infection control knowledge, attitude, and practices of 106 dentists practicing in Sanandaj, Iran. Their results showed a satisfactory level of dentists' knowledge about blood-borne infections (HBV, HCV and HIV), which was significantly associated with work experience, such that higher level of knowledge was observed in more experienced dentists [15]. In the present study, dental specialists scored higher in both knowledge and practice compared with less experienced groups. This result could indirectly confirm the association of knowledge and work experience reported by Rostamzadeh et al. [15].

Kabir et al. evaluated the knowledge, attitude, and practice of a total of 450 Iranian medical specialists (general practitioners, dentists, para-clinicians, surgeons and internists) about HBV and HCV control. Knowledge of specialists regarding the routes of HBV/HCV transmission, prevalence rates, and seroconversion rates following a needlestick was moderate to low. Use of double gloves was reported by only 24% of the surgeons. Considering the unsatisfactory knowledge level of the participants, they recommended continuing education courses about HBV/HCV transmission routes, protection, and seroconversion rates [16]. In the present study, we only evaluated the knowledge and practice of dental healthcare workers. Our study also revealed unsatisfactory knowledge and practice of dentists, which was even less satisfactory in dentists with lower levels of education. Such results suggest implication of continuing education courses particularly for the latter group.

Kadeh et al. assessed the knowledge, attitude and practice of 100 dentists practicing in Zahedan city, Iran, about HIV, HBV, and HCV. The mean knowledge, attitude and practice scores of dentists were 51.4 (out of 63), 20.2 (out of 39), and 64.4 (out of 72), respectively. Despite a satisfactory knowledge level, 95% of the participants declared fear and concerns about HIV, HBV and HCV transmission as a cause of refusing to treat infected patients [17]. This result indicates that good knowledge level is not necessarily associated with satisfactory practice and attitude, and therefore, the latter aspects of infection control should be more focused and reinforced.

Knowledge, attitude, and practice of infection control have also been investigated is many other studies. Khanghahi et al. systematically reviewed the knowledge, attitude, and practice of infection control among Iranian dentists and dental students from 1985 to 2012. Fifteen articles met the eligibility criteria and were included in the study. Their

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review revealed inadequate knowledge, attitude, and practice of infection control in both groups. Protective measures implemented by the Iranian dentists and dental students were not in accordance with the universal standards. They highlighted the need for further education of Iranian dentists to observe infection control standards [8]. An updated review of the dentists' knowledge, attitude, and practice with regard to infection control is required to understand how these measures have changed over the last 10 years.

The present study was not without limitations. We did not evaluate the attitude of healthcare workers towards infection control, which is an adjunct concept when evaluating the knowledge and practice. In addition, we only included dentists practicing in Isfahan Province. Therefore, the present results cannot be generalized to the entire Iranian population.

Conclusion

Dental specialists scored higher in both knowledge and practice compared with other groups. However, the knowledge about infection control was generally poor among all study groups. Such results highlight the need for continuing education courses for dental healthcare providers, particularly less educated dentists.

Conflict of interest

None declared.

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