Knowledge, Attitude and Practice Towards Droplet and Airborne Isolation Precautions Among Dental Health Care Professionals in Shiraz, Iran

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Abstract

Objective: *To determine the level of knowledge, attitude and practice among Iranian dental health care professionals towards droplet and airborne isolation precautions, in Shiraz, Iran.* ***Methods****: A survey was developed and distributed to 152 Iranian dental professionals (faculty and students) from Shiraz University School of Medical Sciences, School of Dentistry, Shiraz, Iran. The self-administered questionnaire was composed of three parts (knowledge, attitude, and practice). After validation of the survey using the Kuder Richardson reliability test and Cronbach's alpha internal consistency coefficient, data was collected and analyzed using Analysis of Variance and the Duncan test to detect the differences among groups. The Spearman coefficient was used to determine the correlation between knowledge, attitude, and practice.* ***Results:*** *The survey was completed by 152 (51.5%) of 295 potential respondents. Mean scores of knowledge, attitude, and practice towards droplets and airborne isolation precautions were poor (98±3.45, 10.51±6.26, 2.68±3.16 from the maximum scores of 11, 55, and 11, respectively). In addition, a positive linear correlation was found between two items of the survey including knowledge-attitude (rho = 0.438, p < 0.001), knowledge and practice (rho = 0.380, p <0.001).* ***Conclusion****: Iranian dental professionals seemed to have low levels of knowledge, attitude and practice towards infection control.*

Key Words: knowledge, attitude, practice, infectious diseases, droplet precaution, airborne precaution, dentists

Introduction

Dental health professionals (DHPs) as well as their patients are at high risk of infections as they are often exposed to a wide variety of microorganisms in the blood and other body fluids during dental treatment. These microorganisms include non-pathogenic and pathogenic bacteria, viruses and fungi (1). Among the pathogenic flora one may find microorganisms that may be responsible for direct transmission of highly infectious diseases such as *Mycobacterium Tuberculosis*, Hepatitis B and C virus, *Staphylococci*, herpes simplex virus types 1 and 2, and the Human Immunodeficiency virus (HIV) (2,3). In addition, a number of viruses responsible for upper respiratory tract infections such as mumps, influenza, and rubella may also pose considerable health hazards to both DHPs and their patients (1,3,4). These infections may be transmitted in dental practices through two major routes, blood or saliva. More specifically, the mode of transmission is through direct contact with droplets (or aerosols) or indirect contact with contaminated instruments and environmental surfaces (5).

Oral fluids may become aerosolized during dental treatments and microorganisms from the oral cavity will contribute to the spread of infections. This is especially the case with hematogenous pathogens (3). Various instruments including dental drills and ultrasonic scalers, especially when combined with the use of water sprays, may produce a high number of aerosolized particles containing body fluids. These particles have diameters of less than 5 micrometers and may be found concentrated within approximately 60 cm of the patient's mouth, making it a viable setting for transmission of infectious pathogens if proper infection control is not practiced (6).

The importance of preventing airborne transmission of microorganisms in a dental setting and the risk of cross-infections between patients and DHPs is well documented (6-9). It is therefore critical for practicing professionals to adapt proper infection control measures to protect both themselves and their patients (3).

In the United States, the Centers for Disease Control and Prevention (CDC) have developed universal precautionary measures for infection control in dental settings. These guidelines include standard precautions as well as transmission based isolation precautions (airborne, droplet and contact precautions), which aim to ensure a safe working environment and potentially prevent further trans-

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mission of infections (10-11). Strict practice of these guidelines will therefore prevent spread of occupational nosocomial infections among DHPs and their patients.

In an era of evidence-based dentistry, DHPs and infection control experts need to know the degree to which these guidelines are followed. The objective of this study was to determine the level of knowledge, attitude, and practice in regard to droplet and airborne infection precautions among dental professionals, including dental students, at Shiraz University of Medical Sciences, School of Dentistry, Shiraz, Iran.

Table 1
Mean (SD) of knowledge, attitude in practice scores regarding droplet and airborne precautions in subgroups of the Shiraz University dental health professionals

Groups	Sub groups	Knowledge* Mean (SD)	Attitude** Mean (SD)	Practice*** Mean (SD)
Faculty	Attending	6.65 (3.47)	7.31 (3.59)	2.25 (3.36)
	Residents	6.67 (2.72)	7.90 (5.59)	2.46 (2.90)
Students	6th year	6.68 (3.34)	10.91 (6.65)	2.96 (3.14)
	5th year	5.95 (3.96)	9.42 (4.40)	1.55 (1.87)
	4th year	7.58(2.27)	11.62 (6.98)	3.03 (3.46)
	Total	6.98 (3.45)	10.51 (6.26)	2.68 (3.16)

*Maximum score=11
**Maximum score=55
***Maximum score=11

Methods

Subjects and Sampling. From May to November of 2002, a survey was sent to all 295 dental faculty and students (those who had clinical training experience and were enrolled in the 4th, 5th or 6th year of the undergraduate dentistry program at the Shiraz University of Medical Sciences, School of Dentistry, Shiraz, Iran). Trained interviewers visited the faculty and students and distributed questionnaires together with the necessary instructions for their completion.

Currently, infection control measures have been taught to dental students through a compulsory course in the undergraduate Dentistry program since 2001. The course objectives are based on the infection control guidelines set by the CDC (3, 4, 5, 11).

After signing an informed consent, the subjects answered the questionnaire and the investigators gathered the data. To maximize the sample size, the Principal Investigator, who is also a member of the national nosocomial infection control committee of Iran, performed a series of lectures to encourage the dental students and faculty members to complete the questionnaire and participate in the study. The importance of the need to know about the knowledge, attitude and practice of infection control measures among practicing dental health professionals in Iran was emphasized. Strict confidentiality for all responses was stressed. The research protocol was approved by the ethics committee of the University of Medical Sciences of Shiraz, Iran.

Questionnaire design. The questionnaire was prepared by an infection control expert, a paediatrician certified in infectious diseases and a psychiatrist and reviewed by experts from the Iranian National Expert Group of Infection Control Specialists. It consisted of questions on knowledge, attitude, and practice of the guidelines with respect to droplet and airborne isolation precautions as described by the CDC (10).

The questionnaire was pre-tested on a random sample of participants to ensure practicability, validity, and interpretation of responses. The validity of the questionnaire was assessed using the Kuder Richardson test (12) for reliability and Cronbach's alpha internal consistency coefficient (13).

Knowledge, attitude, and practice of respondents with respect to droplet and airborne precautions were measured using nine questions for each of the tested categories (knowledge, practice, and attitude). Knowledge was assessed at three possible levels (yes; no; and I do not know), and a score value of 1 was given when the answer to the question was in agreement with the CDC guidelines. For all other responses, a score of 0 was assigned to each individual answer. All the scores were summed and reported on a scale of 0-11.

The questions used to assess attitude were in the format of a Likert-Scale with responses that included very strong, strong, considerable, weak or null where a score of 5 was equivalent to the answer "very strong" and a score of 1 to "null". Therefore, the total score ranged from 11 to 55. For the 5-point Likert-Scale responses for practice questions (always, often, sometimes, seldom, never), a score of 1 was assigned to the answer "always" and a score of 0 to all other answers. The total scores ranged from 0 to 11.

Statistical analysis. For knowledge, attitude, and practice, the frequency of answers and the mean and standard deviations were computed. Analysis of variance and multiple ranges test (Duncan's test) were performed to detect differences of knowledge and practice between all five groups (faculty members, residents and students in 4th to 6th years of education). Spearman's correlation coefficient (r) was used to compute the correlation between knowledge and practice, knowledge and attitude and attitude and practice. A two-sided p-value of 0.05 was considered significant for all statistical analyses.

Results

Adherence data shows that 23 of 43 (53.5%) faculty members, 13 of 32 (40.1%) residents and 116 of 220 (52.7%) students, completed the survey. In total, 152 (51.5%) of the

Table 2
Frequency distribution of answers regarding knowledge, attitude in practice on droplet and airborne precautions

Questions	Knowledge*		Attitude*		Practice*	
	Correct	Incorrect	Very Strong & Strong	Null Response	Correct	Incorrect
Patients with a droplet spread disease should be isolated in a private room.	73.4%	26.6%	64.6%	32.8%	21.8%	78.2%
Patients with a droplet spread disease should be kept apart at a distance of at least 150cm.	97.3%	2.7%	46.3%	49.5%	72.9%	27.1%
Patients with a droplet spread disease should wear a mask during transport.	72.5%	27.5%	65.5%	33.7%	20.8%	79.2%
Masks should be worn if or when a subject is within a 90cm distance from a patient under droplet precaution care.	57.2%	42.8%	65.2%	34.8%	36.7%	63.3%
Hospital wards should be notified prior to receiving patient needing droplet precaution.	63.9%	36.1%	61.0%	34%	29.0%	71.0%
Patients with an airborne transmissible disease should be isolated in a private room with negative pressure.	51.3%	48.7%	51.1%	54.2%	10.2%	89.8%
The door of patient's room with an airborne transmissible disease should always be closed.	49.3%	50.7%	51.3%	48.2%	13.1%	86.9%
Wearing mask is necessary when entering room of patients with chickenpox or measles	47.4%	52.6%	43.2%	52.1%	21.0%	79.0%
All health care workers should be vaccinated with B.C.G vaccine.	95.9%	4.1%	99.7%	0.3%	91.7%	8.3%
Wards should be notified prior to receiving a patient requiring airborne precautions	67.5%	32.5%	56.4%	40.8%	26.7%	73.3%
Patients requiring airborne precautions should wear a surgical mask when being transported	71.6%	28.4%	57.8%	40.5%	23.9%	76.1%

* Percentage of individuals from N = 152.

original sample of 295 DHPs responded to the survey. There were no statistical differences between responders and non-responders regarding their level of education (P=0.335), sex (P=0.256) and age (P=0.532).

The results of the study revealed that less than half of the dental faculty and students (48.4%) had previous formal training on the infection control isolation precautions. Meanwhile, a higher number of individuals (86.3%) agreed with the need for education regarding droplet and airborne isolation precautions.

The mean total score for knowledge was 6.98 (± 3.45) (Table 1). The same trend was observed for attitude (10.51 ± 6.26) and practice (2.68 ± 3.16), with the latter being much lower than the total possible practice score. The majority of the respondents showed considerable knowledge on the droplet precaution guidelines. For instance, when asked about whether it was necessary to wear a protective mask when treating a patient only 57% acknowledged the need for this practice.

With respect to attitude towards adherence to guidelines, this study shows that the majority of the respondents believed that DHPs see the guidelines as necessary with respect to droplet precautions (46.3%

- 65.5%) and airborne precautions (43.2% - 99.7%) (Table 2).

Finally, we observed a linear correlation between knowledge and attitude ($r = 0.438$, $p < 0.001$), and knowledge and practice scores ($r = 0.38$, $P<0.001$) when we combined all groups (dental faculty and students).

Table 3
Spearman's correlation coefficients between knowledge- attitude (K-A), knowledge - practice (K-P) and attitude – practice (A-P) practice scores regarding droplet and airborne precautions stratified by subgroups Dental Health Professionals (N = 152)

Groups	Sub groups	K-A	K-P	A-P
Dental Teachers	Attending	0.465	0.464†	0.039
	Resident	0.526	0.457	-0.019
Dental Students	6th year	0.517†	0.980†	0.101
	5th year	0.642†	0.303	0.191
	4th year	0.272†	0.314†	0.200
	Total	0.438*	0.380*	0.134

* P = 0.001
† P = 0.05.

Discussion

Guidelines for droplet and airborne isolation precautions are mainly developed to prevent transmission of aerosols containing infectious materials to DHPs. Despite the awareness of DHPs and dental students in the pivotal role played on stopping the spread of infectious disease (14-18), little information is available in the literature regarding the awareness of Middle Eastern DHPs. The present study showed a generally poor compliance with droplet and airborne isolation precautions among Iranian DHPs. The results suggest that while the level of knowledge and attitude regarding these isolation precautions among DHPs is acceptable, compliance with these guidelines is poor. Although, DHPs are quite knowledgeable with respect to the contents of the guidelines, this is not reflected in their level of practice. This is may be due to the discordance between DPHs' level of practice and their attitude with respect to the guidelines (Table 2).

Based on the result of the study, approximately half of the dental faculty and students had previous courses regarding isolation precautions and the majority had attended previous educational lectures on this topic. This is probably related to the series of lectures and workshops that the Department of Community Medicine of the Shiraz University undertook on different areas of infection control for both faculty and students.

These results are similar to those reported by Maupome et al in 2000, which showed that despite a relatively good knowledge among 196 dentists in Mexico, only a small number practiced according to the guidelines (19). The results of both studies suggested that more continuing education efforts are necessary. In addition, the programs could help with the identification of work-related infection risks, isolation precaution education and the appropriate training on infection control and assigned duties for specific personnel (20, 21).

The level of correlation between knowledge and practice, knowledge and attitude and attitude in practice revealed that when DHPs are continuously exposed to different educational programs which emphasize the importance of implementing the contents of the guidelines, they are more likely to use the information gathered in their practice (5). McCarthy found similar results from a survey given to a group of general Canadian dentists in 1997 (16). The results of the Canadian survey indicated that the main predictors of the recommended control procedures were age, lack of concern with personal risk and cost of infection control procedures. At the same time, the study highlighted that practices with respect to the guidelines did not follow a similar trend, even though the knowledge was high among the professionals (16).

This study reports some disparity between the isolation guidelines issued by CDC in 1996 regarding droplet and airborne isolation (10) and the answers given by the Iranian DHPs. The high percentage of correct answers to the questions about potential droplet transmission to patents that are waiting for a dental procedure revealed good knowledge; however, only a small proportion of the participants seemed to use such knowledge in practice with patients. For instance, universal precaution guidelines determine that chin-length plastic face shields or surgical masks should be worn when treating patients due to splashing or spattering of blood or other body fluids (3). The high percentage of correct answers on this issue indicated that knowledge, practice, and attitude of the DHPs possibly follow the CDC requirements to prevent spread of infectious diseases.

There are some limitations to the present study. For instance, the responses given by the subjects may not accurately reflect their true attitude and knowledge in practice. If this were the case, it would probably overestimate the results of the study. The research results of this study are restricted to DHPs practicing in Shiraz University School of Dentistryand therefore it may not be possible to extrapolate the results to other dental settings in Iran or other parts of the Middle East. Finally, because this study was restricted to one university, the sample was fixed and underpowered to detect a statistically significant difference for some of the outcomes in the study.

The scores for attitude in practice in our study may indicate that more education is necessary to promote knowledge among DHPs. The present study confirms findings from previous studies that infection control measures among dental professionals are relatively poor (3, 9, 15, 19, 22). DHPs and public health experts may invest time and resources in implementing ways that could improve these measures including provision of continuing educations programs.

Acknowledgements

The article is the result of a research project (81-1412), approved by the Deputy of Research of Shiraz University of Medical Sciences and Health Services. We want to express our special appreciation to the respected research deputy who not only provided financial support, but also showed his interest in solving present difficulties.

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