

## ORIGINAL RESEARCH ARTICLE

# KNOWLEDGE, ATTITUDE, AND PRACTICES TOWARDS DROPLET AND AIR-BORNE ISOLATION PRECAUTIONS AMONG DENTAL HEALTHCARE PERSONNEL IN A DENTAL COLLEGE IN KOTHAMANGALAM: A CROSS-SECTIONAL STUDY

### ABSTRACT

**Background:** For long, infection control has been one of the major concerns of the dental community. Dentists use high-energy equipment, such as drills and scalers, in the presence of bodily fluids such as blood and saliva, and dental plaque. This combination has been shown to generate aerosols of oral micro-organisms, and blood. If infective aerosols persist there may be some danger of exposure in the waiting area and for subsequent patients. With this background, the study was conducted to assess the knowledge, attitude and practice towards droplet and air-borne isolation precautions among dental healthcare personnel in a dental college in Kothamangalam, Kerala.

**Methods:** A cross-sectional questionnaire based survey containing 23 questions to assess the knowledge, attitude and practice on airborne infections isolation precautions. The samples were the teaching faculty members and students of a dental college in Kothamangalam, Kerala. Results were expressed as a number and percentage of respondents for each question and Chi-square test was performed for inferential statistical analysis.

**Results:** The mean knowledge, attitude and practice scores were  $3.94 \pm 1.029$ ,  $5.17 \pm 0.862$ ,  $3.62 \pm 1.596$  respectively with maximum scores of 8, 6 and 7. Significant differences existed in practice scores among faculty and students.

**Conclusion:** The study revealed that although the attitude regarding droplet and airborne isolation precautions among faculty members and students of the institution was high, knowledge and practice remained low.

**Key words:** airborne infections, isolation precautions, droplet, aerosol.

### Authors:

Sanjeev R<sup>1</sup>,  
Suneesh Kuruville<sup>2</sup>,  
Subramaniam R<sup>2</sup>

<sup>1</sup>Reader and HOD,  
Dept. of Public Health Dentistry,  
Indira Gandhi Institute of Dental  
sciences, Nellikuzhy P. O.,  
Kothamangalam 686 691,  
Kerala, India.

<sup>2</sup>Senior Lecturer, Dept. of Public  
Health Dentistry, Indira Gandhi  
Institute of Dental sciences,  
Nellikuzhy P. O.,  
Kothamangalam 686 691, Kerala,  
India.

Address for correspondence:  
Dr. Subramaniam R.,  
Senior lecturer,  
Dept. of Public Health Dentistry,  
Indira Gandhi Institute of Dental  
Sciences, Nellikuzhy P. O.,  
Kothamangalam 686 691,  
Kerala, India.  
E-mail: subbds@gmail.com.

## INTRODUCTION

For long, infection control has been one of the major concerns of the dental community.<sup>(1)</sup> Dental healthcare workers (DHCWs) are at a high risk of cross-infection due to frequent exposure to microorganisms living in patients' blood, droplets of saliva and instruments contaminated with blood, saliva and tissue debris.<sup>(2)</sup> Transmission of infection during dental treatment or surgery can occur through several routes: direct contact with blood, saliva or tissue debris; indirect contact with contaminated instruments or surfaces that have been improperly sterilized; or contact with infective agents present in either the droplets or aerosol particles from saliva and respiratory fluids.<sup>(3)</sup>

Dentists use high-energy equipment, such as drills and scalers, in the presence of bodily fluids such as blood and saliva, and dental plaque. This combination has been shown to generate aerosols of oral micro-organisms, and blood. However, when patients harbour viruses, either blood-borne aerosol generation may prove a significant health hazard to dentists and their assistants.<sup>(4)</sup> If infective aerosols persist there may be some danger of exposure in the waiting area and for subsequent patients.<sup>(4)</sup> Thus diseases like pneumonia, influenza, hepatitis and skin and eye infections may be transmitted during dental treatment procedures from these infective bioaerosols.<sup>(1)</sup>

Aerosols are particles less than 5 micrometers in diameter. The smaller particles of aerosols have the potential to penetrate and lodge in small passages of lung are thought to carry the greatest potential for transmitting infections. Airborne transposition refers to situations where droplet nuclei or dust particles containing microorganisms can remain pendulant in air for long periods of time.<sup>(5)</sup>

With a high prevalence of tuberculosis reported in India, and diseases such as hepatitis B and acquired immune deficiency syndrome posing major threats for the dental personnel, sound knowledge regarding airborne infections and isolation precautions becomes mandatory among the dental health-care personnel.

With this background, the study was conducted to

assess the knowledge, attitude and practice towards droplet and air-borne isolation precautions among dental healthcare personnel in a dental college in Kothamangalam, Kerala

## METHODOLOGY

The study was a cross-sectional questionnaire based survey. The target population was the dental students with clinical exposure (the third and final year undergraduate students) and the teaching faculty members of a dental college in Kothamangalam. A prefabricated validity tested questionnaire was administered to the target population. The questionnaire was divided into two parts. The first part consisted of questions on personal and professional data including age, gender, qualification, experience and type of practice. The second part contained 23 questions on assessment of knowledge, attitude and practice regarding droplet and air-borne isolation precautions. All questions in the questionnaire were close-ended.

The questionnaires were distributed by the faculty members of Department of Public Health Dentistry and dental students posted in the department. The respondents were asked to return the questionnaire immediately.

All returned questionnaires were coded and analyzed. Results were expressed as a number and percentage of respondents for each question and were analyzed using the SPSS Version 17 software. Chi-square test was performed to assess the significant difference in response (if any) in relation to the independent variables such as gender, experience, qualification, year of study (for students) and type of practice (for faculty). The level of significance was set at  $p = 0.05$ .

## RESULTS

### *Respondent's profile*

Among the 111 respondents, 30.6% (n=34) were males and the rest 69.4% (n=77) were females. Seventy six percent (n=85) were dental students and the rest 24% (n=26) were teaching faculty members. Among the faculty members, 73.1% (n=19) had private practice in addition to institution based practice.

**Table I:**  
**Response to knowledge based questions on droplet and airborne isolation precautions**

QUESTION	RESPONSE	n	%	Sig.
Droplet infections are airborne contamination with aerosols or splatter of respiratory fluid.	Yes	110	99.1	NS
	No	1	.9	
Are you aware of the fact that droplets/aerosols produced during routine dental treatment causes life threatening infection?	Yes	107	96.4	NS
	No	4	3.6	
If yes, which infection do u think will spread through droplets/aerosols?	Hepatitis B	9	8.1	NS
	HIV	2	1.8	
	SARS and TB	74	66.7	
	All of the above	26	23.4	
Droplet Nuclei is of the order of	1-5 $\mu$	16	14.4	NS
	50-75 $\mu$	4	3.6	
	25-50 $\mu$	12	10.8	
	75-100 $\mu$	79	71.2	
How far do you think the aerosols during dental treatment can spread or disseminate?	0 cm.	5	4.5	NS
	50 cms.	12	10.8	
	100 cms.	15	13.5	
	150 cms.	14	12.6	
	200 cms.	65	58.6	
Which of the following procedures are known to produce maximum air-borne contamination?	Ultrasonic scalers	53	47.7	NS
	Air polishing	8	7.2	
	Air water syringe	13	11.7	
	Tooth preparation using aerotor	37	33.3	
Are you aware of the existence of a specific guideline for infection control in dental setting.	Yes	94	84.7	NS
	No	17	15.3	
Are you aware of N95 mouth masks?	Yes	15	13.5	NS
	No	94	84.7	
	Yes, I use it	2	1.8	

NS - Not Significant

**Assessment of knowledge, attitude and practice on droplet and airborne isolation precautions**

The results obtained have been summarized and tabulated. Table I, II and III show the response to knowledge, attitude and practice based questions on droplet and airborne isolation precautions respec-

tively. Table IV shows mean and standard deviation (SD) score of knowledge, attitude, and practice of droplet and airborne isolation precautions among the study subjects in relation to educational qualification.

Table II:  
Response to attitude based questions on droplet and airborne isolation precautions

QUESTION	RESPONSE	n	%	Sig.
If you know that your patient is suffering from disease that can potentially spread through droplets/aerosols would you like to treat that patient?	Yes	83	74.8	NS
	No	27	24.3	
If you know that your patient is suffering from a disease that can potentially spread through droplets/aerosols, when will you give him appointment?	Any time, patient's convenience	20	18.0	NS
	Any time, your convenience	13	11.7	
	First	3	2.7	
	Last	75	67.6	
If you know your patient is suffering from infection that spreads through droplets will you isolate the patient?	Yes	98	88.3	NS
	No	13	11.7	
Do you feel that droplet infection control in dental practice should compulsorily be a part of the dental undergraduate curriculum?	Yes	108	97.3	NS
	No	3	2.7	
Do you think your knowledge regarding droplet infection control in dental practice is adequate?	Yes	12	10.8	NS
	No	99	89.2	
Do you think you need any further training on droplet infection control in dental practice?	Yes	110	99.1	NS
	No	1	.9	

NS - Not Significant

**DISCUSSION**

Most dental treatment procedures have the potential for creating contaminated aerosols and splatter.<sup>(6)</sup> The importance of preventing airborne transmission of microorganisms in a dental setting and the risk of cross-infections between patients and DHPs (Dental health professionals) is well documented. It is therefore critical for practicing professionals to adapt proper infection control measures to protect both themselves and their patients.<sup>(7)</sup>

Knowledge, attitude and practice act as three pillars, which make up the dynamic system of life itself. Knowledge is some information that is acquired or gained. It results in congeniality and advertence about an eclectic thing or a situation. Knowledge, being the basic criterion that allows one to earmark between the right and the wrong, is a mixture of comprehension, experience, discernment and skill. Attitude accredits to thinking towards a proper situation. Practice means contemplation of rules and

QUESTION	RESPONSE	n	%	Sig.
Do you follow any specific guidelines for infection control in your routine practice	Yes	89	80.2	NS
	No	22	20.2	
Do you use mouth mask when you work on patients	Always	95	85.6	NS
	Often	12	10.8	
	Sometime	3	2.7	
	Rarely	1	.9	
	Never	-	-	
Do you change your mouth mask after every patient	Always	49	44.1	NS
	Often	26	23.4	
	Sometime	24	21.6	
	Rarely	8	7.2	
	Never	4	3.6	
Do you wear eye protection when you work on patients	Always	43	38.7	S (Significant difference in response among faculty and students) p=0.04
	Often	32	28.8	
	Sometime	21	18.9	
	Rarely	2	1.8	
	Never	13	11.7	
Do you clean/disinfect your eye protection after every patient	Always	18	16.2	NS
	Often	12	10.8	
	Sometime	19	17.1	
	Rarely	30	27.0	
	Never	32	28.8	
Do you wear protective clothing when you work on the patient	Always	83	74.8	S (Significant difference in response among faculty and students) p=0.036
	Often	7	6.3	
	Sometime	7	6.3	
	Rarely	2	1.8	
	Never	12	10.8	
Do you practice pre-procedural mouth rinsing in all your patients?	Yes	19	17.1	NS
	No	92	82.9	

NS - Not Significant, S - Significant

knowledge that lead to action. Thus, a right knowledge, a positive attitude and a good practice are imperative to guide and serve the patients.<sup>(5)</sup> Thus, this study was conducted with the objective of assessing the knowledge, attitude and practice regarding air-borne infections and isolation precautions.

Although 99 percent of the respondents were aware of what droplet were and about 96 percent believing that these aerosols could cause life threatening infections, the knowledge regarding the infections that spread through droplets, size of the droplet nuclei, distance up to which aerosols can spread through droplets during dental treatment were inad-

Table IV:

Mean and standard deviation (SD) score of knowledge, attitude, and practice of droplet and airborne isolation precautions among the study subjects in relation to educational qualification.

EDUCATION	KNOWLEDGE (Mean $\pm$ SD) Max. score = 8	ATTITUDE (Mean $\pm$ SD) Max. score = 6	PRACTICE (Mean $\pm$ SD) Max. score = 7
<i>Students</i>	3.92 $\pm$ 1.003	5.16 $\pm$ 0.871	4.00 $\pm$ 1.318
<i>Graduates</i>	4.00 $\pm$ 0.707	5.00 $\pm$ 1.225	2.20 $\pm$ 1.643
<i>Post Graduates</i>	4.00 $\pm$ 1.225	5.24 $\pm$ 0.768	2.43 $\pm$ 1.886
<i>TOTAL</i>	3.94 $\pm$ 1.029	5.17 $\pm$ 0.862	3.62 $\pm$ 1.596

equate. However vast majority of the respondents were aware of the existence of a specific guideline for infection control in dental setting. This indicate that majority of the respondents although not aware about the theoretical aspects regarding droplets, the respondents including students were aware of the risks of aerosol. The results are in accordance with studies conducted in Udaipur<sup>(5)</sup> and Manipal<sup>(7)</sup>.

Considering the attitude related questions, it was found that a vast majority of respondents including students (74.8%, n=83) were ready to treat a patient with known history of respiratory disease, with about 67.6% agreeing that they would schedule the appointments of such patients at as last patients of the day. Almost 89% of the respondents opined that patients with infections that spread through droplets should be isolated. Moreover 97.3% of the respondents felt that droplet infection control should compulsorily be made a part of the undergraduate curriculum.

These responses indicate a positive attitude of the respondents on droplet infection control measures. The results are similar to a study conducted by Ramesh et al. in Bangalore and Chennai where it was found that the dentists had a good attitude towards the same.<sup>(8)</sup>

The respondent's lack of knowledge on this topic of interest is reflected in the response to the question regarding their adequacy of knowledge regarding

the subject. Almost 90% of the respondents admitted their knowledge being adequate. Furthermore, about 99% felt they require further training in droplet infection control. These responses throw a light on the lack of proper training on airborne infections isolation precautions as a part of the dental curriculum. Inferential statistics further revealed that the observation is not just limited to the students but among the teaching faculty members too.

The questions on practice rather presented a favourable picture. Almost 90% of the respondents opined that they followed specific guidelines for infection control in routine practice. A high proportion of respondents admitted the use of personal protective equipments such as mouth masks and protective clothing while working on patients. However there was a significant difference among students and faculty members wherein students wore protective clothing more than faculty members. Nevertheless, regarding the use of eye protection, while most of the student respondents admitted its usage, this practice was significantly lower among the faculty members. These observations might be due to the fact that the students in the institution are strictly instructed to observe the universal precautions while working on patients.

On the contrary, the study revealed that the practice of pre-procedural mouth-rinse was very low. The personal protective equipments although act as barriers, these are not enough to totally eliminate the

risk of transmission of microorganisms. The current literature suggests that having patients use antimicrobial rinse before treatment may significantly reduce the microbial aerosols. Hence pre-procedural mouth rinsing should compulsorily be practiced before treating the patients.

One of the limitations to this study was the method for assessing the practice of the precaution. We could not supervise the responders' practice and, therefore, had to rely on their subjective self-assessment. Therefore, the responses might have not accurately reflected the true knowledge and attitude in practice and, therefore, the reported level of practice might be even lower than the real level.<sup>(9)</sup>

### CONCLUSION

The study revealed that although the attitude regarding droplet and airborne isolation precautions among faculty members and students of the institution was high, knowledge and practice remained low. This study indicated that there is a need for creating awareness among dentists regarding droplet and airborne isolation precautions. The topic should compulsorily be made a part of the dental undergraduate curriculum. Continuing dental education programs are yet another effective method in imparting awareness among the dental practitioners.

### REFERENCES

1. Shivakumar KM, Prashant GM, Madhu Shankari GS, Subba Reddy VV, Chandu GN. Assessment of atmospheric microbial contamination in a mobile dental unit. *Indian J Dent Res* 2007;18(4):177-180.
2. Chun Chen, Bin Zhao, Wellin Cul, Lel Dong, Na An, Xlangying Ouyang. The effectiveness of an air cleaner in controlling droplet/aerosol particle dispersion emitted from a patient's mouth in the indoor environment of dental clinics. *J R Soc Interface* 2010;7:1105-18.
3. Center for disease control and prevention. Guidelines for preventing transmission of mycobacterium tuberculosis in Health-Care Settings, 2005. *MMWR* 2005; 54(17): 1-141.
4. Bennett AM, Fulford MR, Walker JT, Bradshaw DJ, Martin MV, Marsh PD. Microbial aerosols in general dental practice. *Br Dent J* 2000;189(12):664-7
5. Jain M, Sawla L, Mathur A, Nihlani T, Ayair U, Prabu D, Kulkarni S. Knowledge, Attitude and Practice towards droplet and airborne isolation precautions among dental health care professionals in India. *Med Oral Patol Oral Cir Bucal*. 2010 Nov 1;15 (6):e957-61.
6. Lucia B, Luminita SI, Manuela LM, Ioan D, Dana B. *Airborne Microbial Contamination in Dental Practices in Iasi, Romania. OHDMBSC - Vol. IX - No. 1 - March, 2010*
7. Abhinav S, Bharathi P, Peter S, Shashidhar A. Knowledge and attitude towards droplet and airborne isolation precautions and it's correlation among Indian dental students. *Int J Infect Control* 2011, v7:i1
8. Ramesh N, Anuradha KP. A Survey on infection control knowledge, attitude and practice among Bangalore and Chennai dentists. *Journal of Indian Dental Association* 2000; 71: 116-117.
9. Askarian M, Assadian O. Infection control practices among dental professionals in Shiraz Dentistry School, Iran. *Arch Iranian Med* 2009;12(1):48-51.