

Knowledge and Attitude towards Droplet and Airborne Isolation Precautions and its Correlation among Students of TMDC&RC, Moradabad

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Abstract

Introduction: Aerosols and droplets are produced during many dental procedures that are contaminated with bacteria and blood. These organisms can be transmitted in dental settings through direct contact with blood, oral fluids, or other patient materials. Aim of the current study is to determine level of knowledge and attitude towards droplet and airborne isolation precautions among students of Teerthanker Mahaveer Dental College & Research Centre(TMDC&RC), Moradabad.

Materials and Methods: A questionnaire study was conducted among 249 dental students from TMDC&RC, (76 interns, 81 third years, 92 final years). The self-administered questionnaire consisted of two parts (knowledge and attitude). The validity of questionnaire was assessed using Cranach's alpha internal consistency coefficient. For knowledge and attitude the frequency of answers and the mean and standard deviations were computed. Spearman's correlation coefficient (r) was used to compute the correlation between knowledge and attitude. A p value of ≤ 0.01 was considered significant for all statistical analyses.

Results: The mean scores of knowledge for Interns, Final Year, Third year were 9.35 (1.69), 9.34 (1.72), 9.09 (1.85) and 15.19 (1.71), 14.98 (1.86) and 14.76 (1.86). The mean scores for attitude of the three group were 15.19 (1.71), 14.98 (1.86) and 14.76 (1.86) respectively. Linear correlation was observed between ($r = 1.66$, $p \leq 0.01$) knowledge and attitude scores individually and also with the combined groups.

Conclusion: The dental students had a low to acceptable level of knowledge towards droplet isolation precautions. They still indicated a need for greater awareness. Dental practices should develop a written infection control program to prevent or reduce the risk of disease transmission.

Keywords: Aerosols, Dental Students, Droplet precaution.

Introduction:

Aerosols and droplets are produced during many dental procedures that are contaminated with bacteria and blood. These aerosols present a potential route for disease transmission. Dental patients and dental health care professionals(DHCPs) and other persons not directly involved in patient care but potentially

exposed to infectious agents (e.g., administrative, clerical, housekeeping, maintenance, or volunteer personnel) can be exposed to pathogenic microorganisms including *cytomegalovirus*, *HBV*, *HCV*, *herpes simplex virus types 1 and 2*, *HIV*, *Mycobacterium tuberculosis*, *staphylococci*,

streptococci, and other viruses and bacteria that colonize or infect the oral cavity and respiratory tract.¹

Aerosols are particles less than 5 micrometres 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. These organisms can be transmitted in dental settings through direct contact with blood, oral fluids, or other patient materials. Indirect contact transmission occurs with contaminated objects (e.g., instruments, equipment, or environmental surfaces).^{2,3} Diseases capable of airborne transmission are influenza, pneumonia, tuberculosis, whooping cough and polio.⁴⁻⁶

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 haematogenous 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 micrometres 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. The importance of preventing airborne transmission of microorganisms in a dental setting and the risk of cross-infections between patients and dental health professionals (DHPs) is well documented.³

It is therefore critical for practicing professionals to adapt proper infection control measures to protect both themselves and their patients.⁷ DHCP include dentists, dental hygienists, dental assistants, dental laboratory technicians (in-office and commercial), students and trainees, contractual personnel. Centre for Disease Control and Prevention (CDC) have developed universal precautionary measures for infection control in dental settings. With strict practice, these guidelines were developed to prevent the spread of nosocomial infections among dental health professionals and their patients. Tuberculosis is one of the major causes of droplet spread disease. Worldwide two billion people have latent tuberculosis infection, which constitutes about one third of the

world population. Currently, India has about 14 million prevalent cases of tuberculosis, with two million new cases identified every year.⁸ The application of Universal Precautions (UPs) has been shown to reduce both occupational exposure to body fluids and patient-to-patient transmission of blood-borne viruses (BBVs) via the health care workers.⁹

Thus the objective of the survey was to determine the level of knowledge and attitude towards droplet and airborne isolation precautions and its correlation among dental students in Teerthanker Mahaveer Dental College & Research centre, Moradabad (U.P.), India.

Material and Methods:

A questionnaire study was conducted among 249 dental students, (76 interns, 81 third years, 92 final years) from Teerthanker Mahaveer Dental College and research centre, Moradabad, India (U.P).

Questionnaire design

The self-administered questionnaire consisted of two parts (knowledge and attitude). Questions 1 to 9 tested the knowledge of students, whereas questions 10 to 15 apart from knowledge also checked the attitude. The validity of questionnaire was assessed using Cronbach's alpha internal consistency coefficient. The study population included 249 dental students who voluntarily completed a questionnaire comprising of 15 questions.

Statistical analysis.

A questionnaire survey was conducted among dental students (third year, final year, interns) of Teerthanker Mahaveer Dental College and Research Centre, Moradabad(U.P.), India. The sample size comprised of 81 third year, 92 final year and 76 interns. The study population included 249 dental students who voluntarily completed a questionnaire comprising of 15 questions. Questions 1 to 9 tested the knowledge of students, whereas questions 10 to 15 apart from knowledge also checked the attitude. Knowledge was assessed and a score value of 1 was given when the answer to the question was in agreement with CDC guidelines, For all other responses, a score of 0 was assigned to each

individual answer. Knowledge scores were summed and reported on a scale of 0 to 15.

Only three options considered in each Question. We used a 3 point scale. Also there are six questions, question number 10 to 15 that measure the attitude score. As such for six questions on attitude with three point scale for each, we could have a minimum score of 6 and a maximum score of 18.

Informed consent and university clearance were granted for the study. The questionnaire was distributed in individual classrooms for third and final year dental students; the interns were given the questionnaire in their respective departments. The respondents were instructed to complete the survey without discussing it with other people.

The questionnaire was pretested on a random sample of participants to ensure practicability, validity and interpretation of responses. The validity of questionnaire was assessed using Cronbach's alpha internal consistency coefficient.

For knowledge and attitude, the frequency of answers and the mean and standard deviations were computed. Correlation coefficient (r) was used to compute the correlation between knowledge and attitude. A p value of ≤ 0.01 was considered significant for all statistical analysis.

Results:

The mean total score for knowledge for interns, final year and third year students were 9.35(1.69), 9.34(1.72) and 9.09 (1.85) the mean scores for attitude of the three group were 15.19 (1.71), 14.98 (1.86) and 14.76 (1.86) respectively. (Table No. 1). The high percentage of correct answers to questions about potential droplet transmission to patients that are waiting for dental procedure revealed a good knowledge (Table No. 2). Correlation coefficient was observed between ($r = 1.66$, $p \leq 0.01$) knowledge and scores individually and also with the combined group (Table No. 3). Three groups were identified with low, acceptable and high knowledge towards droplet and airborne isolation precautions. These were based on the number of correct responses towards droplet and airborne isolation precautions questionnaire (Table No. 4).

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. This survey describes the knowledge, attitude and behavior of students in Moradabad, Uttar Pradesh concerning airborne and droplet isolation precautions.

These results are similar to those as shown by Singh et al in 2011, which showed that dental students in Bhopal had low level of knowledge towards droplet and airborne isolation precautions.¹ These results are similar to those as shown by Jain et al in 2010, which showed that dental students in Darshan Dental College and Hospital at Udaipur had low level of knowledge towards droplet and airborne isolation precautions.²

These results are similar to those as shown by Askarian et al in 2005, which showed that dental health professionals in Iran had low level of knowledge towards droplet and airborne isolation precautions.³ Ramesh et al, in a study done in Bangalore and Chennai dentists found that although attitude towards treating patients with infectious disease was positive, a greater knowledge towards infection control was needed.⁷

Splatter was defined by Micik and colleagues as airborne particles larger than 50 μm in diameter. Micik and colleagues stated that these particles behaved in a ballistic manner. This means that these particles or droplets are ejected forcibly from the operating site and arc in a trajectory similar to that of a bullet until they contact a surface or fall to the floor. These particles are too large to become suspended in the air and are airborne only briefly.⁸ Splatter was defined as particles larger than 50 μm in diameter. These particles are too large to become suspended in air and are air borne briefly. Splatter and droplet nuclei also have been implicated in transmission of diseases other than TB, such as SARS, measles and herpetic virus.⁸

Mc Carthy and Mc Donald conducted a similar study in 1997 on general Canadian dentists and found that some predictors of the use of the recommended

Table No. 1: Mean(SD) of Knowledge and Attitude Scores Regarding Droplet and Airborne Precautions in Teerthanker Mahaveer Dental College Students

Groups	Knowledge* Mean(SD)	Attitude** Mean (SD)
Interns	9.35(1.69)	15.19 (1.71)
Final Year	9.34(1.72)	14.98 (1.86)
Third Year	9.09 (1.85)	14.76 (1.86)

*Maximum Score -15 ** Maximum Score -18

Table No. 2: Knowledge about Droplet and Airborne Isolation Precautions among Dental Students

Q No	Question Description	Options	No of Students	% of Students
1	Droplet infections are airborne contamination with aerosols or splatter of respiratory fluid	1) Yes	235	94.38%
		2) No	9	3.61%
		3) Don't Know	5	2.01%
2	Which of the following spreads mainly through droplet infections:	1) Hepatitis-B	23	9.24%
		2) Tuberculosis and SARS	173	69.48%
		3) Hepatitis-B and Tuberculosis	22	8.84%
		4) All the above	31	12.45%
3	Droplet nuclei size is of order of:	1) 1-5 microns	82	32.93%
		2) 25-50 microns	81	32.53%
		3) 50-75 microns	54	21.69%
		4) 75-100 microns	32	12.85%
4	Which of following procedures are known to produce maximum airborne contamination?	1) Ultrasonic and sonic scaler	162	65.06%
		2) Air polishing	7	2.81%
		3) Air-water syringe	37	14.86%
		4) Tooth preparation with aerator	43	17.27%

5	Pre procedural mouth rinse will reduce extent of contamination within Dental aerosols. It will also eliminate Infectious potential of dental aerosols.	1)Both statements are true.	121	48.59%
		2)Both statements are false	28	11.24%
		3)First statement true, second False.	89	35.74%
		4)First statement false, second True	10	4.02%
		5)Don't know	1	0.40%
6	A true aerosol or droplet nuclei may be present in air of operatory after procedure for up to:	1)30 minutes	137	55.02%
		2)60 minutes	70	28.11%
		3)90 minutes	23	9.24%
		4)120 minutes	19	7.63%
7	Patients with droplet spread disease should be kept at least at a distance of:	1)150 cm	87	34.94%
		2)500 cm	67	26.91%
		3)1000cm	48	19.28%
		4)1500 cm	47	18.88%
8	Patients with airborne transmissible disease should be isolated in room with:	1)Negative pressure	54	21.69%
		2)Positive pressure	65	26.10%
		3)Either of above	23	9.24%
		4)Don't know	107	42.97%
9	Mouth mask being used clinically chair side is:	1)1 Layered	29	11.65%
		2)2 layered	175	70.28%
		3)3 layered	36	14.46%
		4)4 layered	9	3.61%
10	The efficiency of mouth mask is only as good as the fit of mask. Is the statement true?	1)Yes	155	62.25%
		2)No	75	30.12%
		3)Don't know	19	7.63%
11	Should elective dental treatment be deferred in patients with droplet spread disease until patient is no longer Infectious as confirmed by physician?	1)Yes	144	57.83%
		2)No	79	31.73%
		3)Don't know	26	10.44%
12	Patients with droplet spread disease should wear mouth mask during transport. Is the statement true?	1)Yes	202	81.12%
		2)No	19	7.63%
		3)Don't know	28	11.24%

13	Is it necessary to notify dental clinics prior to receiving patients needing droplet infection precautions?	1) yes	226	90.76%
		2) no	19	7.63%
		3) don't know	4	1.61%
14	Is it necessary to wear mouth mask when entering room of patient with chicken pox or measles?	1)yes	117	46.99%
		2)no	121	48.59%
		3)don't know	11	4.42%
15	Is it necessary for all health care workers to be vaccinated with BCG vaccine?	1)yes	227	91.16%
		2) no	16	6.43%
		3)don't know	6	2.41%

Table No. 3: Correlation Coefficient between Knowledge, Attitude Scores Regarding Droplet and Airborne Precautions

Group	Knowledge-attitude	p value
Interns	1.72	≤0.01
Final year	1.67	≤0.01
Third year	1.59	≤0.01
Total	1.66	≤0.01

Table No. 4: Level of Knowledge towards Droplet, Airborne and Isolation Precautions among Dental Students

Range	Third year		Final year		Interns		Level of knowledge
	No.	%	No.	%	No.	%	
0%- 50%	11.00	13.58 %	15.00	16.30 %	15.00	19.74 %	Low (0-7)
50%-75%	58.00	71.60 %	68.00	73.91 %	53.00	69.74 %	Average (8-11)
75%-100%	12.00	14.81 %	9.00	09.78 %	8.00	10.53 %	High (12-15)
	81.00	100.00%	92.00	100.00%	76.00	100.00%	249 Total Students

infection control were age < 40 years, lack of concern regarding the increased personal risk or cost of infection control procedures.⁹ During many dental procedures, the use of a rubber dam will eliminate virtually all contamination arising from saliva or blood. If a rubber dam can be used, the only remaining source for airborne contamination is from the tooth that is undergoing treatment. This will be limited to airborne tooth material and any organisms contained within the tooth itself. The use of personal barrier protection such as masks, gloves, and eye protection will eliminate much of the danger inherent in splatter droplets arising from the dental operative site.¹⁰ The universal precaution guidelines determine that chin-length plastics or the surgical masks should be worn when treating the patients due to the splashing or the splattering of the blood or the body fluids.¹¹ The risk of significant airborne contamination is minimized when a rubber dam is used. Unfortunately, there are many dental procedures where a rubber dam can't be utilized. In these situations the only method for minimizing airborne contamination is the high volume evacuation.¹²

The findings should alert dental educators about the importance of educating their students clearly and comprehensively about infection control measures

Conclusions:

The knowledge about the spread of droplet infections and isolation precaution is a must for each and every Dental student and practitioner. The results of the present study showed that dental students at Teerthanker Mahaveer Dental College had low to acceptable level of knowledge towards droplet and airborne isolation precautions. This study indicated a need for greater awareness and awareness regarding aerosols should be increased by conducting CDE programme and workshops in all professional college in future, dental practices should develop a written infection control program to prevent the risk of disease transmission.

References:

1. Singh A, Purohit BM, Bhambal A, Saxena S, Singh A, Gupta A. Knowledge, attitudes, and practice regarding infection control measures among dental students in Central India. *J Dent Educ.* 2011 Mar;75(3):421-7.
2. 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; 15(6):957-61.
3. Askarian M, Aramesh K, Palenik CJ. Knowledge, attitude, and practice toward contact isolation precautions among medical students in Shiraz, Iran. *Amer J Infect Control.* 2006; 34(9): 593-596.
4. Micik RE, Miller RL, Mazzarella MA, Ryge G. Studies on dental aerobiology. I. Bacterial aerosols generated during dental procedures. *J Dent Res.* 1969; 48(1):49-56.
5. Miller RL, Micik RE, Abel C, Ryge G. Studies on dental aerobiology. II. Microbial splatter discharged from the oral cavity of dental patients. *J Dent Res.* 1971; 50(3):621-5.
6. Micik RE, Miller RL, Leong AC. Studies on dental aerobiology. Efficacy of surgical masks in protecting dental personnel from airborne bacterial particles. *J Dent Res.* 1971; 50(3):626-30.
7. 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.
8. Harrell SK, Molinari J. Aerosols and splatter in Dentistry: A brief review of literature and infection control implications. *J Am Dent Association* 2004; 135(4): 429-37.
9. McCarthy GM, MacDonald JK. The infection control practices of general dental practitioners. *Infect Control Hosp Epidemiol.* 1997; 18:699-703.
10. Michelson A, Delclos GL, Felknor SA, et al. Compliance with universal precautions among physicians. *J Occup Environ Med* 1997; 39: 130-137.
11. Araujo MW, Andreana S. Risk and prevention of transmission of infectious diseases in dentistry. *Quintessence Int.* 2002; 33:376-82.

12. Stephen k. Airborne Spread of Disease – The Implications for Dentistry. J Calif Dent Assoc. 2004 Nov;32(11):901-6.

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