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Original Article

Evaluation of fear, anxiety, and knowledge among dental providers during the COVID 19 pandemic



Mayank Kakkar ^{a*}, Abdul Basir Barmak ^b, Sangeeta Gajendra ^c

^a Department of General Dentistry, Eastman Institute for Oral Health, Rochester, NY, USA

^b Department of Dentistry Eastman Institute for Oral Health, Rochester, NY, USA

^c Department of Community Dentistry, Eastman Institute for Oral Health, Rochester, NY, USA

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Background/purpose: COVID-19 has caused a global public health crisis with a major impact on the dental community. The unknown nature of the disease, close and prolonged contact between the patient and provider, aerosol-generating dental procedures in dental settings, guidelines that kept evolving are some of the factors that have alarmed the dental community. The purpose of this study was to evaluate the fear/anxiety among dental providers and assess the knowledge and related practice modification in a post-doctoral dental institution in Upstate New York.

Materials and methods: An online, anonymous, validated survey was sent to all dental faculty and trainees (n = 358) including general dentists and specialists from various departments between August and October 2020. Descriptive statistics and Chi-square goodness-of-fit test were performed.

Results: A total of 144 responded to the survey. It was reported that the majority of the dental providers (faculty (80%) and trainees (90%)) were afraid of getting infected with COVID-19 from the patient. Approximately 90% in both groups reported fear of carrying the infection home to their family and about reports of people dying. The majority of dental providers were well-versed with the Centers for Disease Control and Prevention guidelines. There was difference in knowledge about using N-95 and level 3 masks with face shields for various dental procedures.

Conclusion: The study concluded that COVID-19 related fear/anxiety among dental providers was immediate and needed to be addressed.

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* Corresponding author. Department of General Dentistry, Eastman Institute for Oral Health, 625 Elmwood Ave, Rochester, NY, 14620, USA.
E-mail address: mayankuever@gmail.com (M. Kakkar).

Introduction

Coronavirus disease (COVID-19), caused by a newly discovered highly infective virus, the Severe Acute Respiratory Syndrome-Coronavirus-2 (Sars-CoV-2), is often asymptomatic but potentially lethal.¹ Coronavirus, primarily transmitted through respiratory droplets,¹ can cause mild to severe respiratory tract infection or death in older individuals with comorbidities.² Wuhan, China witnessed the first outbreak of COVID-19 in December 2019.³ COVID-19 was declared as a global pandemic on March 11, 2020,⁴ with high mortality and morbidity rates from 2019 to 2021.⁵ The first case of COVID-19 among dentists was reported on January 23, 2020, in Wuhan University with an additional eight more reported later.⁶

Angiotensin-converting enzyme 2 (ACE2), a transmembrane protein serves as the main entry point into cells for some coronaviruses, including SARS-CoV-2. ACE2 receptors, specifically in the saliva make it biologically plausible for the oral cavity to be a route of entry,⁷ targeting the salivary gland epithelial cells.⁷ While approximately 50% of patients reported ageusia, more than 90% had a persistent loss of taste sensation in the early stages of COVID-19 before hospitalization.⁸

The evolution of COVID-19 has made the dental community more distressed.⁹ Dental providers, including students, dental trainees and faculty are at an increased risk in dental clinics.¹⁰ The primary concerns for dentistry are the risks of dental treatment requiring close and prolonged contact between the provider and patient,¹¹ transmission through respiratory droplets and aerosols¹² and viral particles remaining viable in aerosols for many minutes to hours.¹¹ Procedures that use ultrasonic scalers, air–water syringes and handpieces are some of the sources of aerosols in the dental clinic. Inhalation of aerosols containing water, saliva, blood, debris and microorganisms can increase the risk for COVID-19 transmission.¹² The Centers for Disease Control and Prevention (CDC) recommended screenings to identify asymptomatic patients to reduce the risk to dental providers.¹³ Since saliva is a rich source of SARS-CoV-2,⁷ standard protective measures are not adequate to mitigate the risk of COVID-19. Dental settings should balance the need to provide necessary services while minimizing the risk to patients and the dental personnel.^{14–16}

State governors, state dental boards and the American Dental Association (ADA) announced executive orders to postpone all elective procedures on March 16, 2020.¹⁷ Dentists are on the list of high-risk professions and may develop severe anxiety.^{18–20} Practice closure or reduction may also attribute to this.¹ An extended parallel process model predicting individuals' reaction to fear inducing stimuli was used to show that degrees of perceived threat and efficacy influenced willingness to perform preventive behaviors. The authors found that 94.67% of oral health providers perceived the threat of COVID-19 infection high, with 94% washing hands frequently with water and soap and 93% using hand sanitizer.²¹

Dental students faced temporary suspension of didactics, routine and non-essential dental treatments.²² Several schools moved to e-learning, canceling external rotations, rescheduling licensing exams and alternative

graduation formats used.²³ Key concerns for dental students were inadequate clinical experiences, motivation, residency application, finances, academic performance, and health²³ as well as future career plans, licensure examinations, limited employment opportunities, and long-term stability of the dental profession.²⁴ While the majority of dental students (>80%) were concerned about returning to school as the classes would be held in groups, transitioning to face-to-face education,^{25–27} a quarter of them thought about changing their profession.²⁶ Students reported elevated levels of depression (60.64%), anxiety (37.02%), and stress (34.92%).²⁸ The study recommended a need for robust infection control, improved engineering control, and knowledge of working with patients during the pandemic to alleviate student anxiety.

An online survey²⁹ found that 68% of 403 dental professionals from 19 countries frequently utilized social media for information on COVID-19. The younger dental professionals with an undergraduate degree and shorter clinical experience used social media more regularly. The authors estimated that 33% had moderate to severe anxiety, significantly associated with social media use frequency ($p = 0.016$).²⁹ Dentists reported high levels of anxiety, fear and depression despite a high level of knowledge about practice modification.^{25,29,30} Dentists in United Kingdom valued the time away from the profession during the lockdown relishing the absence of regulatory and contractual stressors.³¹ Factors including family health, fear of losing patients, economic loss, and reduced practice attributed to their fear. Understanding these determinants is imperative to reinstate the psychosocial well-being of dental providers and positive functioning during this pandemic.³²

The purpose of this study was to evaluate the fear and anxiety among the dental faculty and trainees at a post-doctoral dental institution during the COVID-19 crisis. This study also assessed the knowledge about COVID-19 and related practice modifications based on existing guidelines.

Materials and methods

This study was approved by the University's Institutional Review Board (RSRB00005254). The survey was conducted from August to October 2020 by using a secure online web application called REDCap. The estimated sample size was calculated as 127, assuming a margin of error of 7% and confidence level 95% from a total of 358 dental faculty and trainees. All subjects (210 faculty and 148 trainees (residents, fellows, and preceptors) from a post-doctoral dental institution in Upstate New York were invited to participate in this study. The online survey link was circulated via e-mail to all the faculty and trainees by the Registrar's office.

A validated survey¹⁹ was used. The survey comprised of three sections: demographic information; fear and anxiety section (8 questions) and knowledge and practice modifications section (11 questions). The survey assessed fear/anxiety using a Likert scale. Four questions assessed knowledge regarding the COVID-19 pandemic. Each correct answer was scored +1 while each incorrect answer was scored -1. The mean and overall scores were calculated for each question.

Descriptive statistics were performed using SPSS (Version 26). Four of the Likert scale categories assessing fear and anxiety were collapsed into two categories- "Not at all" and "Yes" (little, moderate and great extent). A Chi-square goodness-of-fit test was used to find the significance count difference of the categorical outcomes regarding fear/anxiety and knowledge across different levels of relevant demographic variables.

Results

A total of 144 responded including general dentists and specialists from various departments, of which 135 participants were included in the data analyses (Fig. 1). The demographic information of the participants is presented in Table 1. The majority of the participants were below the age of 50 years (73%), males (55%) and Caucasian (66%) and specialists (58%).

Fear/anxiety

Dental providers experienced a wide array of COVID-19-related fear/anxiety. Overall, faculty had less fear/anxiety compared to trainees. Statistically significant differences were noted for all outcomes (Table 2).

Practice-based proficiency

Majority of participants were well versed with the CDC guidelines. There was a difference in knowledge about the use of N-95 and level 3 masks and face shields for dental procedures. Almost 42% participants preferred to test patients for COVID-19 prior to dental appointment. Procedures generating aerosols were favored for COVID-19 testing (Table 3).

Knowledge

- (i) **Mode of transmission**-if the correct selections were made the score would be 2. However, this score was affected by selecting the wrong options. The mean score for faculty was 1 and for trainees it was 1.2. This study found that 75% of faculty and 71% of trainees knew the correct responses for mode of transmission of SARS CoV-2 (Table 4).
- (ii) **High risk aerosol producing procedures**- For this question, four out of 5 choices were correct, making the maximum attainable score of 4. The mean knowledge score was 2.716 and 2.49 for faculty and trainees respectively. Only one faculty and six trainees selected the wrong option, the remaining chose the correct responses.

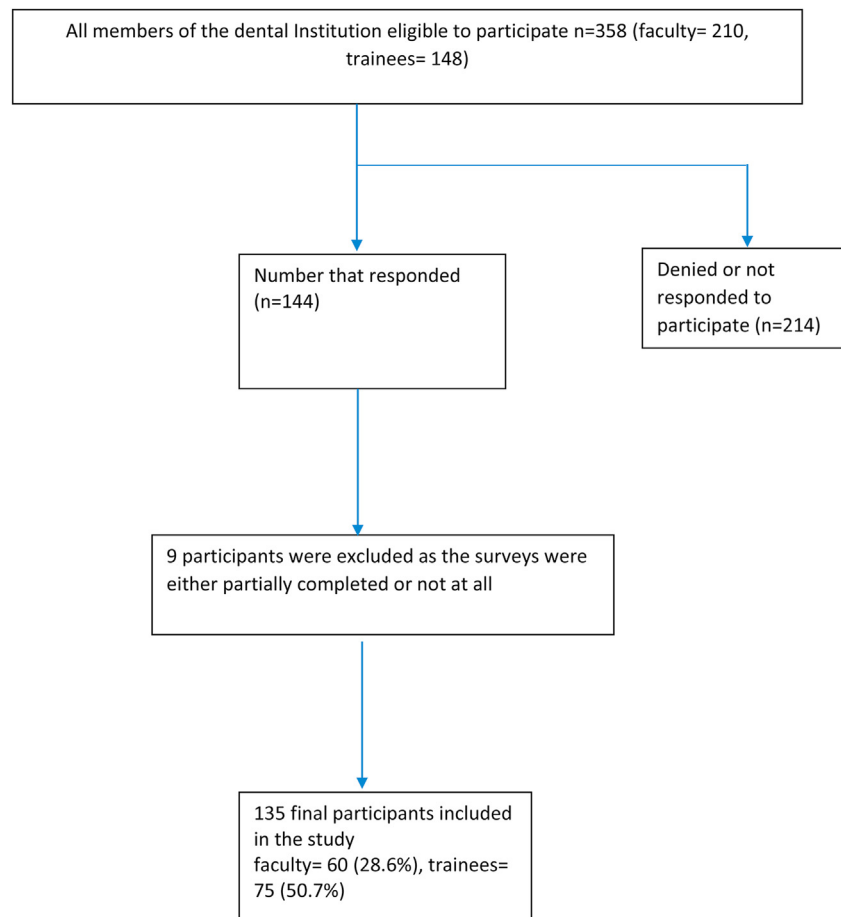


Figure 1 Flow chart of the participant's recruitment.

Table 1 Demographic information of the of the dental care professionals (n = 135).

Characteristics	Faculty	Dental trainee
Gender		
Male	33 (55.93%)	41 (54.66%)
Female	26 (44.06%)	34 (45.33%)
Other	0 (0%)	0
Total	59 (100%)	75 (100%)
Not answered	1	0
Total	60	75
Age		
Below 30	0 (0%)	34 (45.33%)
31–50	25 (42.37%)	40 (53.33%)
51–60	22 (37.28%)	1 (1.33%)
Above 60	12 (20.33%)	0 (0%)
Total	59 (100%)	75 (100%)
Not answered	1	0
Designation		
General dentist	21 (35.59%)	35 (46.66%)
Specialty	38 (64.40%)	40 (53.33%)
Total	59 (100%)	75 (100%)
Not answered	1	0
Race		
White	47 (79.66%)	42 (56.75%)
African American	0 (0%)	1 (1.35%)
Asian	11 (18.6%)	22 (29.72%)
Native American/Alaska	0 (0%)	0 (0%)
Pacific Islander/Native Hawaiian	0 (0%)	0 (0%)
Others	1 (1.69%)	9 (12.16%)
Total	59 (100%)	74 (100%)
Not answered	1	1
Ethnicity		
Hispanic	3 (5.17%)	9 (12.16%)
Non-hispanic	55 (94.82%)	65 (87.83%)
Total	58 (100%)	74 (100%)
Not answered	2	1

iii) **Appropriate method for reducing contamination during aerosol generating procedures:** In this question, four choices were correct answers, thus the maximum score that could have been achieved was 4. The mean score was 2.9 for faculty and 2.98 for trainees. Only one faculty and one trainee selected all the four correct responses.

iv) **Symptoms to look for while screening for COVID-19:** Of the 14 symptoms, 10 symptoms were correct and 4 were incorrect. The maximum attainable score was 10. This study found that only 26.7% of faculty and 12% of trainees checked all the correct symptoms. The mean score was 6.1 for faculty and 5.24 for trainees.

Discussion

There were limited information and guidelines about preventing or mitigating the risk of COVID-19 transmission in a dental setting when this study was initiated. This study found that about 87% of dental providers were anxious

about treating patients with suspected symptoms of COVID-19, similar to a previous study.²⁰ Similarly, the COVID-19 related mortality induced fear among most trainees (96%) and faculty (85%).³³ The widespread morbidity and mortality associated with COVID-19, aerosols and droplet transmission and high viral load in saliva are potential factors to instill fear/anxiety among dental providers. Approximately 90% of dental providers in 30 countries were fearful and anxious about disease transmission from patients and co-workers,¹⁹ similar to this study findings (faculty 81%, trainees 90%).

The ideal approach of COVID-19 management should include controlling the disease and addressing the psychological consequences. Dental providers may avoid providing dental treatment leading to delay, which will ultimately lead to complications as well as financial loss. Due to the unpredictable nature of the disease, emerging variants, prolonged incubation period, asymptomatic carriers, isolation, quarantine and possibly fatal outcomes, dental providers need to keep abreast of the latest information. The dental institution where this study was conducted implemented timely practice modifications to ensure the

Table 2 Fear and anxiety assessment of the dental faculty and trainee at EIOH (n = 135).

Section-2	Dental faculty				P-value	Dental trainee				P-value
	Not at all	Yes	Total	Missing		Not at all	Yes	Total	Missing	
Are you afraid of getting infected with COVID-19 from a patient ?	10 (17.2%)	48 (82.8%)	58 (100%)	2	0.000*	6 (8.1%)	68 (91.9%)	74 (100%)	1	0.000*
Are you afraid of getting infected with COVID-19 from a co-worker?	11 (19%)	47 (81%)	58 (100%)	2	0.000*	8 (11%)	65 (89%)	73 (100%)	2	0.000*
Are you anxious when providing treatment to a patient who is coughing or suspected of being infected with COVID-19?	7 (12.1%)	51 (87.9%)	58 (100%)	2	0.000*	9 (12.3%)	64 (87.7%)	73 (100%)	2	0.000*
Do you feel nervous when talking to patients in close vicinity?	31 (53.4%)	27 (46.6%)	58 (100%)	2	0.590	12 (16.2%)	62 (83.8%)	74 (100%)	1	0.000*
Do you have fear that you could carry the infection from your dental practice back to your family?	7 (12.1%)	51 (87.9%)	58 (100%)	2	0.000*	7 (9.5%)	67 (90.5%)	74 (100%)	1	0.000*
Are you afraid of getting quarantined if you get infected?	17 (30.4%)	39 (69.6%)	56 (100%)	4	0.003*	13 (17.8%)	60 (82.2%)	73 (100%)	2	0.000*
Are you anxious about the cost of treatment if you get infected?	23 (41.1%)	33 (58.9%)	56 (100%)	4	0.181	14 (18.9%)	60 (81.1%)	74 (100%)	1	0.000*
Do you feel afraid when you hear that people are dying because of COVID-19?	9 (15.5%)	49 (84.5%)	58 (100%)	2	0.000*	3 (4.1%)	71 (95.9%)	74 (100%)	1	0.000*

*Significant at $P \leq 0.05$.

safety of providers while providing patient care. It also implemented employee assistance programs focusing on COVID-19 to help allay the fears amongst their employees. Yet the dental providers reported fear/anxiety. More than 85% of dental providers complied with the CDC guidelines. Participants also reported that information was gleaned from newspapers, institutional guidelines, blogs, national and international organizations. The faculty were comfortable using the N-95 with face shield for aerosol-producing procedures and Level 3 mask with face shield for non-aerosol-producing procedures. The vast majority of faculty were above 50 years old, more experienced with a better comprehension of the high-risk circumstances and thus were more resilient and less fearful. However, the trainees preferred using an N-95 mask with face shield for all dental procedures. The dental trainees' belief regarding their own personal threat of COVID-19 infection together with their belief in the effectiveness of the CDC recommended guidelines enhanced the trainees' likelihood of using additional preventive infection control measures.³⁴ Antibacterial mouth rinses significantly reduce microbial load, but only 68% of participants reported using it every time and 14.3% reported using it "sometimes". Complying with the recommended guidelines can influence dental providers to adopt the robust infection control protocols.²⁹

The results showed an overall low score for knowledge about the mode of transmission of COVID-19. This may be due to negative scoring for incorrect responses. Moreover, the evidence for the route of transmission was still emerging during the time this study was conducted. The participants were definitely knowledgeable about the key modes of transmission. Based on the dental providers' knowledge about COVID-19, there are opportunities for continuing dental education. Furthermore, as the pandemic evolves, the guidelines are likely to change, making it even more critical to ensure dental providers are educated with current evidence-based protocols.

Although there were initial reports of COVID-19 afflicting dental providers,⁶ a recent study³⁵ found that COVID-19 rate among dentists was less than 1%. The low prevalence indicates that the current infection control recommendations may be sufficient to prevent infection in dental settings. Therefore, the fear and anxiety among providers may be unfounded.

This study has a few limitations. As a cross-sectional study with a convenience sample, selection bias and social-desirability bias may have an impact on the results with over-reporting of knowledge and practices about COVID-19 or under-reporting of fear and anxiety. Despite the limitations of this study, an insight into the fear and anxiety

Table 3 Practice based assessment of the dental faculty and trainee at EIOH (n = 135).

Section - 3 Practice based		Dental faculty (n = 60) (%)	Dental trainee (n = 75) (%)
Which guidelines do you follow to stay up-to-date with the current COVID-19 situation? Select all that apply.	Centers for Disease Control and Prevention (CDC)	50 (83.33%)	65 (86.66%)
	World Health Organization	32 (53.33%)	30 (40.00%)
	New York State Dental Association	42 (70%)	38 (50.66%)
	American Dental Association	45 (75%)	43 (57.33%)
	Other	12 (20%)	3 (4%)
	Missing	0	0
What do you consider as appropriate respiratory protection in dental practice during the current outbreak? Select all that apply	N-95 mask alone for all dental procedures	5 (8.33%)	10 (13.33%)
	N-95 mask with face shield for all dental procedures	16 (26.66%)	48 (64%)
	N-95 mask with face shield for only aerosol-producing procedures	36 (60%)	25 (33.33%)
	Level 3 mask and face shield for non-aerosol-producing procedures	40 (66.66%)	20 (26.66%)
	Other	3 (5%)	9 (12%)
	Missing	0	0
Do you ask every patient to rinse his/her/their mouth with anti-bacterial mouthwash before treatment as recommended by the CDC?	Always	34 (61.81%)	52 (73.23%)
	Sometimes	10 (18.18%)	12 (16.90%)
	Never	11 (20%)	7 (9.85%)
	Total	55 (100%)	71 (100%)
	Missing	5	4
if yes, which mouthwash do you use?	0.2% Chlorhexidine (CHX)	11 (25.58%)	20 (31.74%)
	1% Povidone iodine (PI)	2 (4.65%)	0
	3% Hydrogen peroxide (H2O2)	30 (69.76%)	43 (68.25%)
	0.05% Hypochlorous acid (HOCl)	0	0
	Normal Saline	0	0
	Water	0	0
	Total	43 (100%)	63 (100%)
	Missing	17	12
If you come across a patient with suspected COVID-19 symptoms, then what will be your action plan?	Continue the dental treatment	0	0
	Schedule the patient at the end of the day	0	0
	Defer all the dental procedures	8 (14.54%)	7 (10%)
	Avoid only aerosol-generating procedures	1 (1.81%)	5 (7.14%)
	Send the patient to ER	1 (1.81%)	2 (2.85%)
	Send the patient for home isolation	1 (1.81%)	3 (4.28%)
	Refer to medical provider	14 (25.45%)	5 (7.14%)
	Refer the patient for COVID-19 testing	30 (54.54%)	48 (68.57%)
	Total	55 (100%)	70 (100%)
	Missing	5	5
Do you think patients need to be tested for coronavirus before the dental appointment?	Yes	15 (26.78%)	41 (57.74%)
	No	32 (57.14%)	17 (23.94%)
	Not sure	9 (16.07%)	13 (18.30%)
	Total	56 (100%)	71 (100%)
	Missing	4	4
If yes, which procedures do you feel should require coronavirus testing	Surgical extractions	15 (100%)	37 (90.24%)
	Simple extractions	10 (66.6%)	22 (53.65%)
	Restorations	13 (86.66%)	32 (78.04%)

(continued on next page)

Table 3 (continued)

Section - 3 Practice based		Dental faculty (n = 60) (%)	Dental trainee (n = 75) (%)
before the appointment.	Root canal treatments	12 (80%)	34 (82.92%)
Select all that apply	Pulpotomy/pulpectomy	13 (86.66%)	31 (75.60%)
	New exams	5 (33.33%)	14 (34.14%)
	Recall exams	5 (33.33%)	13 (31.70%)
	Dental X rays	4 (26.66%)	14 (34.14%)
	Prophy	10 (66.66%)	29 (70.73%)
	Scaling and root planing	13 (86.66%)	32 (78.04%)
	Crown preparation	14 (93.33%)	35 (85.36%)
	Crown impression	6 (40%)	15 (36.58%)
	Crown cementation	14 (93.33%)	17 (41.46%)
	Complete and partial denture	6 (40%)	14 (34.14%)
	Dental implants	12 (80%)	35 (85.36%)
	Dental bleaching	4 (26.66%)	17 (41.46%)
	Periodontal surgeries	12 (80%)	32 (78.04%)
	Orthodontic treatment (braces, retainers, clear aligners)	6 (40%)	16 (39.02%)
	Missing	0	0

Table 4 Assessment of knowledge among the dental faculty and dental trainee (n = 135).

Characteristics	Mean score for dental faculty (n = 60)	Mean score for dental trainee (n = 75)	Overall mean score (n = 135)
Mode(s) of transmission for the COVID 19	1	1.2	1.0417
High risk aerosol producing procedures	2.716	2.49	2.43
Appropriate method for reducing contamination during aerosol generating procedures	2.9	2.98	2.76
Symptoms do you look for while screening for COVID-19	6.1	5.24	5.27

provides an opportunity to better prepare dental providers cope in future.

The COVID-19 related fear and anxiety among dental providers were immediate and needed to be addressed. Dental institutions should focus on continuing education of evidence-based knowledge about COVID-19 related dental practices, ensure safe practices and improve psychosocial well-being to mitigate fear and anxiety during future pandemics.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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